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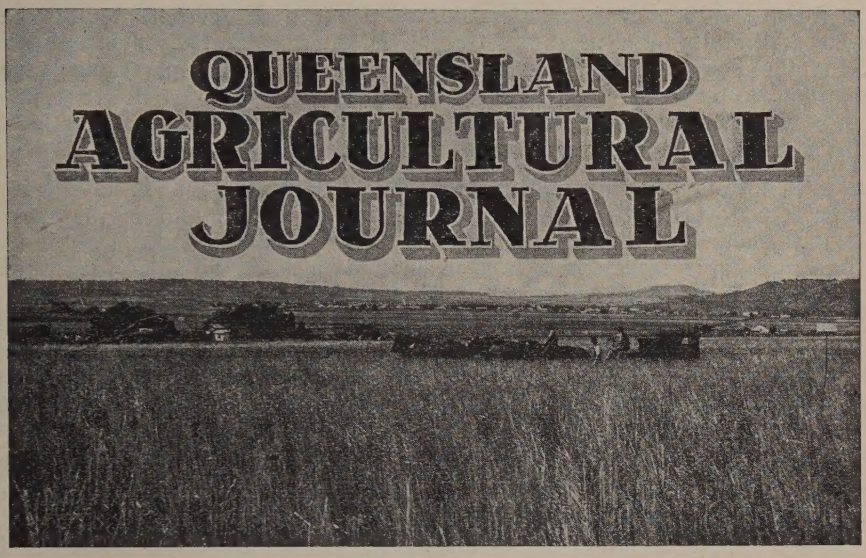

VOL XLII. 1 SEPTEMBER, 1934. PART 3.

Event and Comment.

Return of the Premier.

NO returning statesman could have had a warmer welcome home than that given to the Premier, Hon. W. Forgan Smith, by a crowd of several thousand people, on his arrival in Brisbane on 12th August from his mission to Great Britain on behalf of the primary producers of this State. The vast gathering was representative of every section of the community, and the reception accorded the Premier was remarkable for its enthusiasm and obvious sincerity. As the Sydney mail steamed into the station, the Caledonian Pipe Band played an inspiring welcome.

In the course of an address from a dais on the railway platform Mr. Forgan Smith said that he was glad to be back among the people of Queensland and to receive such a splendid greeting. He had left Brisbane for a purpose connected with the welfare of the State, and he was happy to say he was perfectly satisfied with the result of his mission.

On his visit overseas he received every courtesy and consideration from members of the British Government, from public bodies, and from the people.

He not only entered into negotiations with members of the Government, but he took the opportunity, through the press and at public gatherings, to put the case for Queensland and Australia. That case was listened to with considerable attention and sympathy, and he was satisfied that the people of Great Britain were entirely sympathetic with the people of this country. Their aims and aspirations were similar to those of Australians, and they were favourable to trade with this country. However, he found there was a great deal of misconception about Australian conditions.

"There is a feeling in Europe to-day," he said, "that is having its effect on Government policy, is preventing recovery, and is the most serious menace of all to the return to normal employment. I refer to that form of insanity known as economic nationalism—the idea that people can sell without themselves being purchasers. As a consequence barriers are being built up in foreign European countries in the hope of improving things; but inevitably the result is reflected in the poverty of their people, lack of development, and, worst of all, suspicion between nations that may lead to serious results. However, to a large extent that feeling is passing away."

While in Great Britain he pointed out that the people of that country were taking more imports from foreign countries than from all the Dominions and the Crown Colonies put together. He had told Britain that the competition of Australia in the markets of the United Kingdom was not with the local farmer but with other countries. On the figures available there was no case of any kind in favour of restriction of Dominion produce. The whole system was based on an economic fallacy, which Australia, in its own interests, must at all times resist.

There could be no justification for restricting the bounty of nature while thousands of people had insufficient of the necessities of decent livelihood. The solution of the problem lay in giving the people access to the bounty of nature, and to make use of the improvements and comforts that modern science had made available to man. Better distribution and an increase in consumption were required rather than restriction. No remedy could be found for improvement in world conditions in advocating a policy of restriction. Furthermore, Australia could never agree, as any part of a definite policy, to sharing her markets with other countries.

Any form of quotas must inevitably benefit only the older countries. As an example, in the dairying industry Denmark was the chief competitor. Denmark was carrying every hoof its pastures could carry, and any quotas based on existing output must stabilise the market for that country. On the other hand Australia's capacity to expand was unlimited, and in its own interests the nation could never agree to a policy of restricted development.

Mr. Forgan Smith added that his visit to Britain had been propitious. The case he was able to put to the British Government and, through the press and on the public platform, to the people could result in nothing but good, and the assurances he had received from the British Government were to the benefit of this country. Particularly was that true in regard to the sugar and dairying industries.

"The future is with us if we are resolute," added the Premier. "We require to do a great deal ourselves to improve the conditions of

our industry. We must produce goods of excellence and make known their merit to possible customers. That could be done by the organisation of markets in parts of Britain."

Generally he was satisfied with the result of his mission, and he was looking forward with restored health to carrying on his work for the development of Queensland. Lands he had visited were confronted with problems similar to our own, but his considered view, as a result of his experience, was that it was a grand thing to be connected with such a country as Queensland and a great privilege to be a citizen of Australia.

Animal Health—Research Work at Yeerongpilly.

DISCUSSING the invaluable research work being done at the Animal Health Station at Yeerongpilly recently, the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, said, *inter alia,* that the modern conception of nutrition is entirely different from the views earlier held. A hundred years ago foodstuffs were not recognised very definitely in relation to their food values, but every country in the world to-day is endeavouring to demonstrate the economic importance of food, and to see that every food constituent is in its right proportion to every other constituent. Research work along those lines is likely to help the production of stock in the most economic way. For instance, it is well known that protein is the most expensive constituent in the balanced ration; and, that being so, it became necessary to determine the minimum amount of protein that should be fed. In order that the stockowners in Queensland may be advised on this most important matter an officer is stationed at Yeerongpilly whose sole duty consists of compiling experimental data in relation to foodstuffs.

At the present time his work is confined to observing the effects of foodstuffs on pigs and poultry, and already some remarkable data have been assembled. There is every reason to anticipate valuable results from this research, benefiting not only pig and poultry raisers, but animal husbandmen generally.

Research also was being prosecuted at Yeerongpilly with respect to parasite life in stock, which was likely to lead to valuable and important results.

One thing necessary is the creation of a public conscience among farmers so that the work done at Yeerongpilly may be duly appreciated, for experience has shown that farmers will not avail themselves of an organisation unless they know something about it.

It has been the practice, therefore, during the past twelve months, to invite leading dairymen from different parts of Queensland to come to Yeerongpilly and stay several days there. Many classes have been held, in which there has been a happy combination of practical work and theoretical instruction, with most gratifying results. Farmers who had taken advantage of this opportunity went back to their own districts very favourably impressed with the organisation at Yeerongpilly, recognising that it was a very definite and valuable help to the farming community.

Invaluable service also was rendered by the staff of Yeerongpilly, both to the farmers and to the community in general, by the diagnoses made of stock diseases at the animal health station. Arrangements had been made whereby primary producers in any part of the State could send the viscera of animals or other specimens for examination.

Rice Weevil in Maize.

ROBERT VEITCH, B.Sc.Agr., B.Sc.For., F.R.E.S., Chief Entomologist.

THE rice weevil, *Sitophilus oryzæ* L., is quite definitely the most destructive grain pest in this State, its unenviable reputation being due mainly to the fact that it inflicts very severe losses on maize and wheat.

As its name indicates, it was originally found attacking rice, but in the years intervening since it was first studied many other foodstuffs have been recorded as being attacked, maize, wheat, oats, barley, sorghum, macaroni, biscuits, and prepared breakfast foods being the most frequent sufferers.

Stanthorpe readers will remember that during the 1931-32 season the rice weevil was quite frequently found attacking apples both in the packing sheds and on the trees. Although the weevil grubs were often found feeding in the fruit no weevils were bred from such apples, but the blemishes were sufficient to warrant the rejection of attacked fruit. Such an occurrence is, of course, rather unusual, but it serves to indicate the wide range of foods subject to attack by this notorious pest.

Although commerce has ensured world-wide distribution from its Indian home, the rice weevil is predominantly a tropical and subtropical species, and in such regions it breeds more or less continuously and soon destroys suceptible grain left unprotected from its ravages.

Life History.

The first point of interest to be noted in the life history of this species is the fact that the weevil lives for about four or five months and during that time it can lay as many as four hundred eggs. Each of these eggs is deposited in a very small cavity gouged out by the weevil on the surface of the grain, each egg cavity being cemented over by a secretion which makes its detection somewhat difficult. As a reasonably large proportion of these eggs hatch it is obvious that even a small initial infestation may rapidly assume serious proportions, particularly during the warmer weather.

A soft white legless grub hatches from the egg after an incubation period of a few days and proceeds to feed inside the grain. This grub becomes full-grown in two or three weeks and then transforms to the pupa from which the final stage in the insect's life, namely the weevil, emerges a week later to feed, mate, and repeat the life cycle. The weevil is a dark-brown hard-bodied insect about one-sixth of an inch in length with a long downwardly projecting snout, a further characteristic feature being the occurrence of four reddish spots on the back. These lighter patches are not present in the closely allied species known as the granary weevil, *Sitophilus granaria* L., which furthermore is slightly larger than the rice weevil and is unable to fly. The granary weevil possesses habits similar to those noted in the discussion of the rice weevil, but seems partial to colder regions whereas the rice weevil, as already indicated, shows a marked preference for warmer countries.

The life cycle of the rice weevil may be completed in less than a month, but such rapid development occurs only during summer, and in the colder weather a much longer period is required for its completion. The number of generations occurring in Queensland each year is not definitely known, but overseas, under somewhat comparable conditions, there are usually six or seven generations annually.

Serious infestation may reduce large masses of grain to an almost valueless powder, and this is particularly so when grain is unavoidably subject to long storage or to prolonged voyages in slow cargo vessels. Much the greater part of the damage is inflicted by the weevil grubs, but the weevils themselves also nibble at the grain, thereby assisting their offspring in the work of destruction.

Control Measures.

Measures for the control of this pest may be discussed under three headings—firstly, cultural practices tending to minimise infestation of the crop in the field; secondly, fumigation of the stored grain once it has become infested; and, thirdly, natural control by insect enemies of the weevil.

It will probably be most satisfactory to dispose of the natural enemies first, because the control measure constituted by these natural enemies is quite the least useful of the three just mentioned. Not infrequently small wasp parasites are bred from infested grain, but the general experience is that such parasites do not become at all common until the grain is very heavily infested, and the damage has then pretty nearly reached its peak. The writer has frequently observed the same disappointing late association of parasites with the pea and bean weevils commonly responsible for the almost total destruction of cowpea seed. It may be taken as practically certain that the possibility of reasonable control by parasites offers no prospects of success.

Turning now to measures which may be taken to minimise infestation of the growing crop, it is interesting to note that the rice weevil does not usually eat through the husks of maize; hence where the choice is possible a maizegrower should select a variety producing a long, tightly fitting husk. The next important point is to ensure that any maize crop exposed to attack is harvested as soon as it is mature, thereby reducing to a minimum the period of exposure to danger. The third important point is to eliminate as far as practicable the sources of infestation in a new crop, and in this connection the best procedure is to destroy as much waste maize material as possible, both in the field and in the barn. In such waste material the weevils can continue breeding on a large scale during the period elapsing between crops. It is here necessary to emphasise a fact that is not well known, and that is that the rice weevil possesses well-developed wings and is capable of flying, more particularly during warm weather. In late spring and early summer rice weevils leave infested barns and other grain stores and migrate to the fields of maize where they initiate an infestation which may subsequently become very serious if conditions are favourable to the development of the insect; hence the desirability of ensuring a thorough clean-up of maize stores in the vicinity of growing crops.

Even if all precautions are observed infestation of the harvested maize may occur, but nevertheless if it does ensue it should be on a lesser scale than would have been the case had no precautions been observed.

The third control measure is fumigation of stored grain, and for such a purpose carbon bisulphide is probably the most useful fumigant available under Queensland conditions.

Satisfactory results are obtainable by such fumigation, but they may be disappointing if the temperature is below 60° F., and it is generally considered that a temperature of at least 70° F. is required to obtain a reasonably good kill. For this reason fumigation should not be undertaken in cold weather, and it should start in the morning so as to obtain the benefit of the higher day temperatures.

The maize to be treated for insect infestation is placed in a suitable container, which should be as airtight as possible. The carbon bisulphide is then poured into saucers or other dishes placed on top of the grain, so that the carbon bisulphide gas, which is heavier than air, will diffuse throughout the container, which should be immediately tightly closed. Pouring the carbon bisulphide on to a few bags placed on top of the maize to be treated is sometimes preferred to pouring the fumigant into saucers, as the liquid volatilises more rapidly from the surface of the bags than from the saucers. The required lethal concentration of the gas is thus obtained earlier than is the case where saucers are used.

The general practice is to allow 4 or 5 lb. of carbon bisulphide to each 1,000 cubic feet of the container, the duration of the fumigation being thirty-six hours. The fumigated maize should then be exposed to the air to remove the gas. The germination of the maize is not normally affected by this treatment if dry and mature when treated and if the precaution of airing the seed after treatment is observed. Where infestation is severe a second fumigation may be necessary two or three weeks after the first.

The quantity of carbon bisulphide required for each 1,000 cubic feet of the container has been given as 4 or 5 lb., but it is necessary to add that such a figure is based on the assumption that the container is reasonably airtight. If the owner suspects a high degree of leakage then the quantity of carbon bisulphide should be increased.

Obviously, reinfestation of fumigated maize may ensue if steps are not taken to prevent it; hence the usual procedure is to store the treated grain in thoroughly clean and closely-sealed containers, giving little chance of reinfestation.

Before leaving the subject of carbon bisulphide fumigation readers are reminded that this chemical must be handled with a certain amount of discretion. It evaporates rapidly on exposure to the air and forms a gas which is highly explosive and inflammable. Farmers using it should, therefore, make certain that it does not come into contact with a flame or highly heated pipes, or any other highly heated material. Furthermore, it is desirable to refrain from smoking when using carbon bisulphide. The operator should also make every effort to avoid inhaling the gas, for serious consequences will ensue if this precaution is not observed. With the exercise of common sense, however, the fumigant can be handled with quite a reasonable degree of safety.

Other fumigants are available for dealing with grain infested by the rice weevil, but they are not likely to displace carbon bisulphide under existing Queensland conditions. Heat treatment may also be

used for eliminating weevil infestation, a temperature in the vicinity of 140° F. being sufficient to kill the weevils if maintained for several hours. Generally, however, facilities for the application of heat treatment on an extensive scale are not available.

So far attention has been devoted almost exclusively to weevil infestation in maize, mainly because such infestation is a more or less permanent state of affairs in Queensland. Wheat, however, may sometimes be very severely attacked while in store, although large quantities of that cereal are often absolutely free from infestation. In this connection it is interesting to note that the rice weevil reacts very markedly to the moisture content of the grain in which it is breeding, and the low moisture content of many wheat crops prevents its breeding therein. Furthermore, infestation of the growing crop is not a menace as is the case with maize; hence a wheat crop harvested in a sound, dry condition and maintained in such a state under adequate storage precautions normally has a reasonably good chance of remaining commercially free from infestation.

STRAINING WIRE NETTING.

A simple and efficient wire-netting fence is shown in the drawing. It consists of two lengths of 2 inches by 6 inches wood with two or three bolts passed through them so that they can be securely clamped to the end of the fencing as shown. A

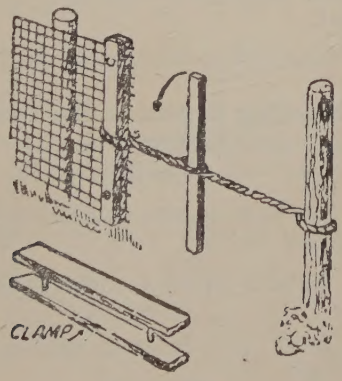

Plate 131.

heavy rope is passed round both pieces, around a fence post, and tied. A stout stick is used to twist the rope, thus, pulling the fence as tight as desired. The device can be made in a short time from material that can be found on every farm.

Sterility in Dairy Cows.

By K. S. McINTOSH, H.D.A., B.V.Sc., Veterinary Officer, Animal Health Station, Yeerongpilly.

FROM observations made by field officers of the Department and numerous inquiries at this Station it is evident that sterility among dairy herds of Queensland is fairly widespread.

The losses due to sterility are not spectacular as in the case of rapidly fatal diseases, but their very insidiousness often allows the condition to become well established before any action is taken by the stockowner.

The lack of accurate breeding records and the reliance of the dairy farmer on memory tend to make him overlook irregularities in breeding, but the economic loss caused by sterility throughout dairy districts must amount to an enormous sum each year, and it is only by intelligent and energetic individual effort on the part of dairy farmers that it can be combated.

In this short series of articles it is proposed to deal separately with each factor causing sterility to enable the farmer to deal with the problem in an intelligent manner.

The losses from sterility are due to—

1. Loss of milk supply.
2. Inability to regulate milk supply during the season.
3. Annual loss of calf.
4. Time and money lost on treatment sometimes of hopeless cases.
5. Loss of cattle (for slaughter) which fail to breed.
6. Greater strain imposed on the bull in an endeavour to get cows in calf.
7. Waste of fodder and pasturage for cattle that will not breed.

Breeding Organs of the Cow.

To understand the fundamentals of sterility we must first make a brief study of the anatomy and physiology of the breeding apparatus.

In the cow the breeding organs consist of the ovaries, Fallopian tubes, uterus, vagina, and vulva.

Reference to figs. 1 and 2 gives some idea of the relation and position of these organs.

The ovaries are small solid organs, one on each side, about the size of small almond nuts.

These during sexual heat produce the female ova or eggs which are very small cells. These ova travel down the tiny Fallopian tubes where one of them comes in contact and fuses with one of the male cells or sperms which have been introduced into the cow's vagina by the bull during service.

The male germ cell or sperm after being deposited in the vagina swims, by means of a tail, through the neck of the uterus and into the

PLATE 132.

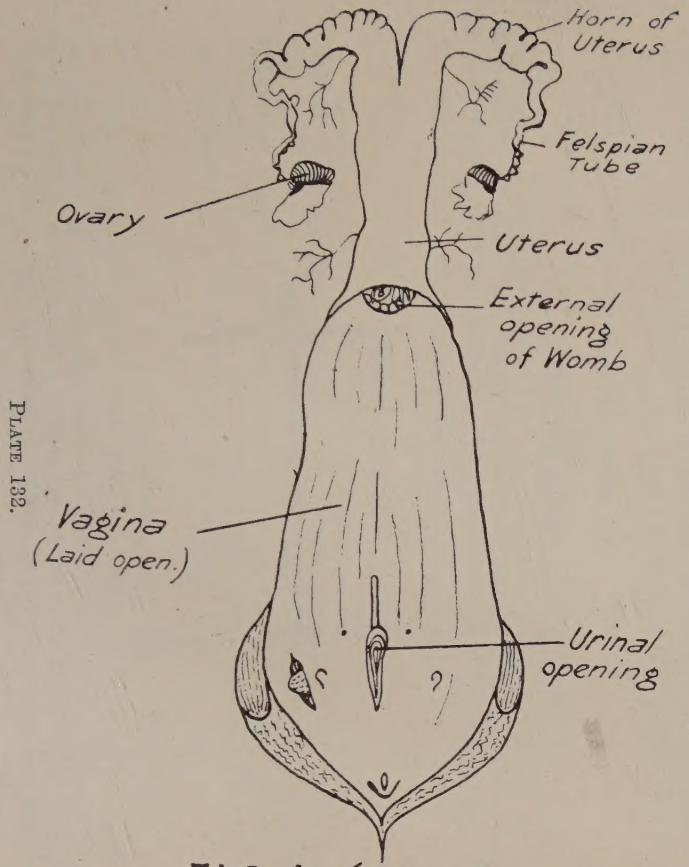

FIG. 1. (After Sisson.)

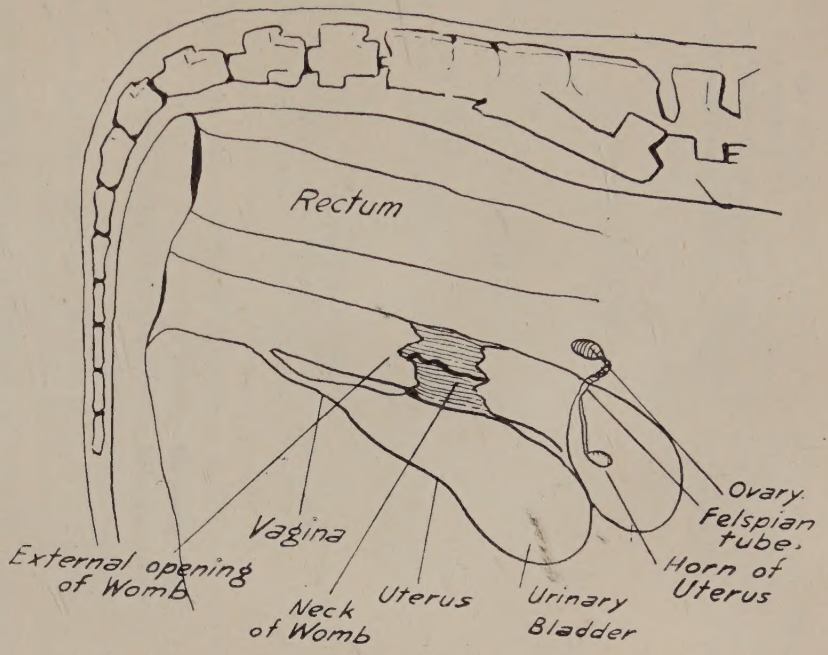

FIG. 2. (After Sisson.)

body of the uterus. It is either here or in one of the Fallopian tubes that it unites with the female cell or ovum. This process of union of the male and female cells is known as conception or fertilization.

After conception the fertilized ovum begins to divide and multiply

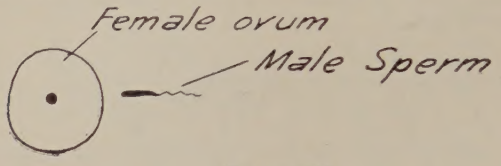

PLATE 133.

and attach itself to the wall of the uterus. From this it derives its nourishment, and, after considerable multiplication and growth, the young calf or fœtus is formed.

Causes of Sterility.

It will be seen by the foregoing that anything which prevents the union of the male and female cells or the attachment of the fertilized female cell to the wall of the uterus will cause sterility.

Conditions which cause sterility therefore may be divided into—

1. Diseases of the ovary.
2. Diseases of the uterus and Fallopian tubes.
3. Diseases of the vagina.

In the next article it is proposed to deal with diseases of the ovary and diseases of the uterus and Fallopian tube.

These will include contagious abortion, retained afterbirth, and septic conditions of the uterus.

A WIRE SPLICER.

The illustration shows a wire stretcher and splicer which has been used with success. Take a piece of ¾-inch rod 18 inches long and drill a ¼-in. hole 1 inch from one end to receive the wire to be stretched. Flatten the other end and drill a

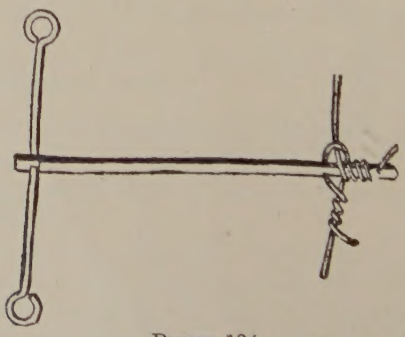

PLATE 134.

$\frac{7}{16}$-inch hole to receive a ⅜ by 18-inch rod for a handle. Put it through and turn the loops on each end. The illustration shows how to use when repairing a broken wire. It can also be used as an ordinary stretcher.

Milk Fever.

K. S. McINTOSH, H.D.A., B.V.Sc.

Causes.

THE cause of milk fever is still obscure, many theories have been forwarded and many rejected. The general opinion, however, is that the enormous drain on the body resources, due to the formation of the calf, and the sudden production of large quantities of milk lowers the calcium content of body tissues and fluids resulting in the muscular spasm and paralysis of milk fever.

The sugar content of the animal seems to be closely allied to its calcium content, and some observers believe that a sudden reduction of animal sugars is responsible. Both schools of thought produce evidence to support their claims. Hence the most recent treatment is the intravenous injection of Calcium gluconate, which treatment is producing very good results.

Symptoms.

Usually the best producers are affected, the symptoms occurring within two days of calving. In mild cases staggering and paddling of the feet is noticed, and, if treated at this stage, practically all recover. Some animals show a short period of excitement and others do not. The cow goes down and cannot rise. There is a profuse flow of saliva, grinding of teeth, the neck is usually stiff, the head being carried high or turned toward one flank. In bad cases the cow is completely prostrated and lies stretched out on the ground. Secretion of milk may or may not cease. If the temperature be taken at this stage it will probably be below normal, thus "milk fever" is not a true fever.

The effects of an attack of milk fever are either death or complete recovery. Fortunately the treatment described below is fairly effective and very few cases are lost.

If antiseptic precautions are not carried out in detail, however, the treatment may be followed by an attack of mammitis.

Treatment Preventive.

Do not overfeed cows in calf. The cow should be in good condition but not fat. See that her bowels are functioning properly, and, if not, give *small* doses of epsom salts, green feed, &c. Give the cow a plentiful supply of sterilised bonemeal at all times. This assists her to maintain her supply of calcium. If milk fever is anticipated, do not strip out the cow completely for several days after calving.

Curative.

Remove any milk and inflate the udder with air. This may be done by means of a special pump, or failing this, with a bicycle pump or human enema syringe with a rubber tube and teat syphon attached. The apparatus consists of an air pump, a cylinder containing sterilised

(or medicated) cotton wool, a rubber tube, and a teat syphon (see diagram).

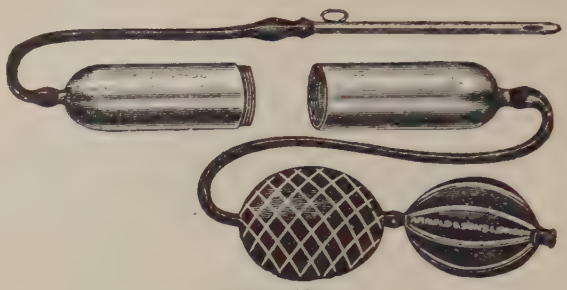

PLATE 135.
MILK FEVER AIR FILTER WITH BELLOWS.

It is extremely important that the teat syphon should be thoroughly boiled immediately before use and the operator's hands well washed.

The external opening of the teat is wiped clean with methylated spirits, the syphon is inserted, and the udder inflated until fairly firm. After all quarters have been inflated the udder is massaged gently to distribute the air.

The cow should be propped up on her brisket by means of bags of chaff or straw and turned over to the other side every hour or two. The manure should be removed by means of an enema or by hand. If she has not stood up within six hours repeat the inflation.

For several days after an attack the cow should be given green feed and bran mashes and should not be stripped out but only a moderate quantity of milk removed.

On no account should a cow with milk fever be given any medicine by the mouth.

QUEENSLAND SHOW DATES, 1934.

September.

Enoggera, 1st
Imbil, 7th and 8th
Ingham, 7th and 8th
Pomona, 12th and 13th
Innisfail, 14th and 15th
Mareeba, 20th and 21st
Beenleigh, 20th and 21st
Rocklea, 22nd
Malanda, 26th and 27th
Kenilworth, 29th

October.

Southport, 5th
Millaa Millaa, 5th and 6th
Tully, 12th and 13th

The Parasites of Sheep.

By F. H. S. ROBERTS, M.Sc., Entomologist, Animal Health Station, Yeerongpilly.

EXTERNAL PARASITES.

THE more important external parasites of the sheep in Queensland consist of lice, the sheep ked, the scrub tick, and the sheep blow-flies.

SHEEP LICE.

Two species of lice are known to be present among sheep in Queensland, the red-headed sheep louse, *Bovicola ovis* L. (*Trichodectes sphærocephalus* Nitzsch), and the foot louse, *Linognathus pedalis* Osborn. They belong to the order Anoplura. The red-headed sheep louse is a member of the suborder Mallophaga, which includes all those species of lice known as biting lice.

The foot louse belongs to the suborder Siphunculata, which includes the true blood suckers. In this group the mouth parts are formed for piercing the skin and sucking up the blood and fluids.

Description.

The red-headed sheep louse has been long established in Queensland, and is a small flattened insect about one-twenty-fifth of an inch in length (Plate 136, fig. 2). The head is broader than long, reddish in colour, with prominent eyes and short three-segmented antennæ. The abdomen is pale-brownish, with a number of darker transverse bands. The legs are short and yellowish, with one terminal claw. This is the more common sheep louse, and is to be found close to the skin among the wool of the neck, shoulders, back, and thighs, though in cases of severe infestation it may occur on all parts of the body.

The foot louse has appeared among Queensland sheep only within recent years, and as yet does not appear to be by any means common. This louse (Plate 136, fig. 3) has a short bluntly pointed head, about as wide as it is long. It is much longer and broader than the biting louse, measuring up to one-twelfth of an inch in length. The mouth parts are formed for piercing and sucking. The antennæ are prominent and five-segmented, the terminal segment with three or four bristles. Eyes are absent. The legs are strong, terminating in a powerful claw. The front pair of legs are the smallest, the hind pair the largest. As in all lice, wings are absent. As its name infers, it is to be found about the feet and undersides of the legs towards the belly.

Life History.

The life histories of all species of lice are very similar, that for each species differing only in detail. The eggs, commonly known as "nits," are fastened by the female to the hair, wool, or feathers of the host. After an incubation period of several days the eggs hatch and the young lice appear. They resemble their parents except in size, and reach sexual maturity by a series of moults or castings of the skin.

The eggs of the red-headed louse hatch in from six to eight days, though in cold weather they may take as long as ten days. Sexual maturity is reached in sixteen to eighteen days after hatching.

In the case of the foot louse the eggs hatch in ten to eighteen days, the average period of incubation being about twelve days. The young lice begin to lay eggs when they are eleven to twelve days old.

Means of Spread.

Once present in a flock lice spread very rapidly. Most cases of lice infestation occur from direct contact, but it should not be forgotten that it is possible for clean sheep to become infested from yards, sheds, and paddocks which have previously housed lousy sheep.

The lice spend the whole of their life on the sheep, and can live only a short time off the host. When removed from the sheep, sucking lice live about three or four days, and biting lice six to eight days. Under such conditions the lice do not continue to lay eggs, but eggs attached to wool may continue to hatch for three weeks or longer when detached from the sheep and kept in a warm place. Young lice will live only three or four days off the sheep. Thus it will be seen that paddocks and yards containing scraps of wool detached from the sheep when rubbing and biting themselves may remain infective for at least twenty-five days. Shearing-sheds in which lousy sheep have been shorn are probably one of the greatest sources of infestation. During the process of shearing and handling the fleeces some of the parasites become detached and tags of wool containing lice and eggs are scattered throughout the shed. During cold weather dislodged lice and eggs are usually not a source of danger, as the lice become inactive and the eggs fail to hatch. This also applies to infested yards and paddocks. During warm weather, as previously mentioned, the shed may, however, be a source of infestation for twenty-five days or more.

Control and Eradication.

As lice are the cause of a fairly heavy economic loss to the sheep industry, it should be the aim of any grazier possessing lousy sheep not only to control them, but to eradicate them altogether. If clean sheep are to be introduced into an infested property, they should be placed in a paddock which has been spelled at least thirty days. By a system of paddock rotation and, of course, dipping, the eradication of lice is by no means a difficult matter. Particular attention to cleanliness in the shearing-shed is essential. If clean sheep are to follow infested sheep after shearing, there should be an interval of thirty days between shearings. If this is not practicable, the shed should be thoroughly cleaned out, all loose wool gathered and burnt, to be followed with a liberal washing out with boiling water and a good disinfectant.

For biting lice two dippings at an interval of fourteen to sixteen days are considered sufficient to eradicate them from a flock. With the foot louse, on the other hand, owing to the extended incubation period of ten to eighteen days, and to the comparatively short maturity period of eleven to twelve days, it is necessary to dip three times at ten-day intervals. Should this be impracticable with large numbers of sheep, a second dipping after the interval recommended for the biting louse will be found to give good results.

THE SHEEP "TICK."

The sheep "tick" or ked, *Melophagus ovinus*, is not really a tick, but a wingless fly. Ticks have eight legs, an inconspicuous head, and a

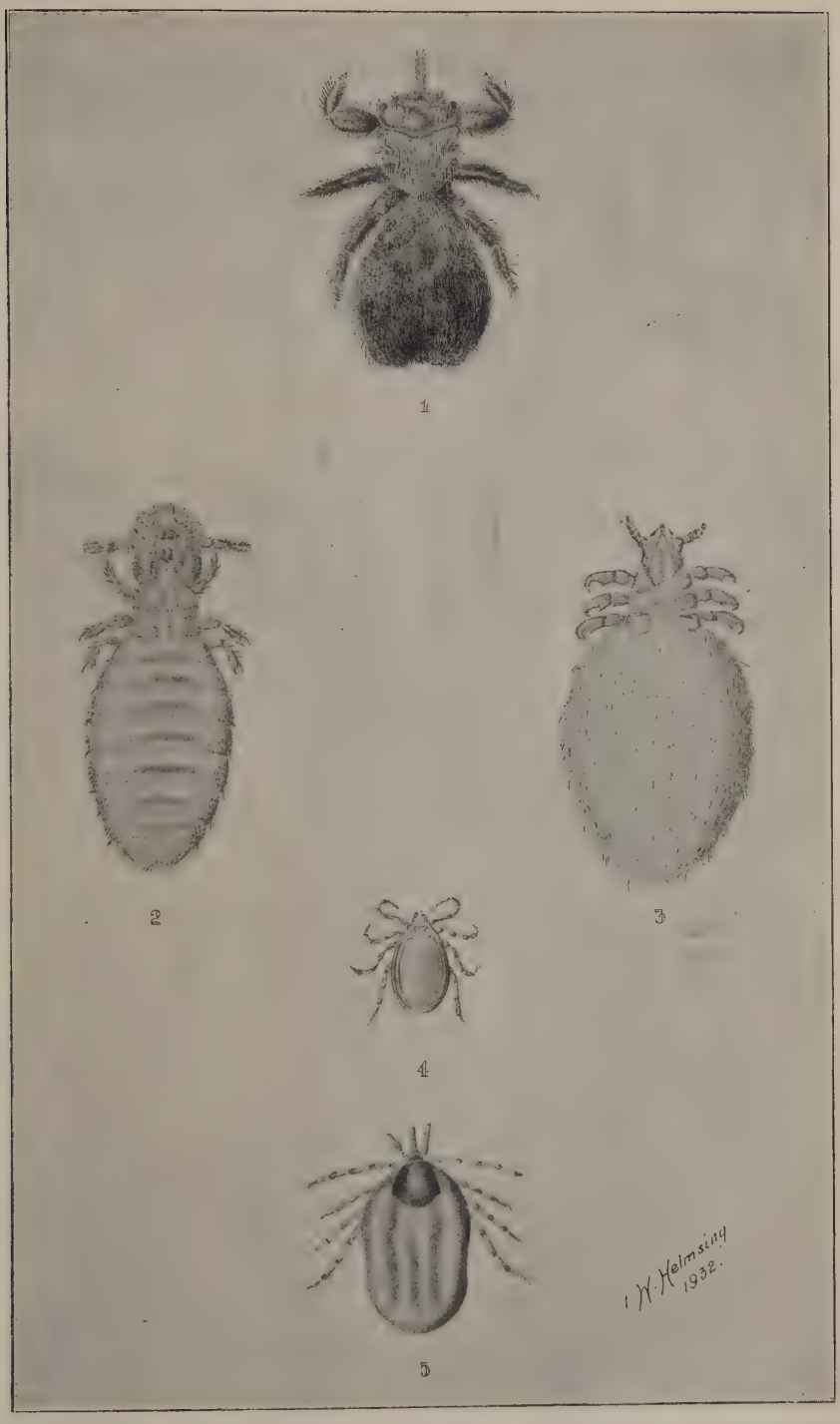

PLATE 136.—EXTERNAL PARASITES OF SHEEP.

FIG. 1—Sheep "Tick" or Ked, *Melophagus ovinus* Linn., × 7.
FIG. 2—Red-headed Sheep Louse, *Bovicola ovis* Linn., × 23.
FIG. 3—Foot Louse, *Linognathus pedalis* Osborn, × 23.
FIG. 4—Scrub Tick, *Ixodes holocyclus* Neumann (Male), × 5.
FIG. 5—Scrub Tick, *Ixodes holocyclus* Neumann (Female), × 5.

fused thorax and abdomen, while the ked has only six legs and a distinct head, thorax, and abdomen. This parasite belongs to the Dipterous family Hippoboscidæ, members of which, generally known as spider or louse flies, occur on a great variety of animals, especially birds. In colour the ked is reddish or grey-brown, and may measure up to one-quarter of an inch in length (Plate 136, fig. 1). The head is small and sunk into the thorax. The abdomen is comparatively large, especially when the insect has just fed. The mouth parts are constructed for piercing and sucking, and the insect lives on blood. It is capable of moving fairly rapidly among the wool, and its movements forwards and sideways are distinctly crab-like. Keds appear to be most numerous among the wool of the neck, breast, shoulders, belly, and thighs.

Life History.

The female sheep tick is curious in that instead of an egg it lays a fully-matured larva, which is enclosed in a soft white membrane. This is, strictly speaking, a pupa, but is commonly known as the "egg." The true egg, however, is retained within the body of the female and hatches there. Seven to ten days after the egg hatches the pupa is laid and is attached to the wool by a glue-like substance. In about twelve hours the white membrane hardens and turns brown. After a period varying from nineteen to twenty-four days, depending upon the season of the year, the adult fly emerges from the pupa. In thirteen to twenty-three days after emergence the female lays her first pupa. The life cycle is, therefore, egg and larval stage within the female insect, seven to ten days; pupal period nineteen to twenty-four days: and laying of first pupa thirteen to twenty-three days after emergence. The female deposits her pupæ, for a while at least, at the rate of one every nine days, but the total number she is capable of laying is not known.

Control.

Like the lice, the ked spends the whole of its life upon the sheep, and is incapable of breeding elsewhere as is frequently thought. The adult insect, however, has been known to live as long as eighteen days when detached from the sheep, though usually the survival period rarely extends beyond four or five days. The pupæ have been known to remain viable for as long as forty-six days in tags of wool which have become removed from the sheep by biting and scratching. Here again, as in the case of lice, sheep may become infested in two ways—either by direct contact with infested sheep, which no doubt is the chief method of spread, or from yards, sheds, and paddocks which have housed infested sheep. In order, therefore, to make sure that such yards, sheds, and paddocks are clean, it would be necessary to spell them during the warmer months for a period of about two months. During the winter, however, if the temperature drops to freezing at any period during the day or night, adult ticks will not survive longer than about five days, and as pupæ are readily killed by frosts, such infested yards, &c., need not be spelled longer than a week. Shearing-shed sanitation is again stressed.

In order to get the best results from dipping, it is necessary to dip twice. The second dipping is required as, although the first dipping will probably kill all the adult ticks, many of the pupæ will survive and form a nucleus of reinfestation. The second dipping is recommended twenty-one to twenty-five days after the first.

THE SCRUB TICK.

Three species of ticks have been recorded as attacking sheep in Queensland—namely, the cattle tick, *Boophilus microplus;* the brown dog tick, *Rhipicephalus sanguineus;* and the scrub tick, *Ixodes holocyclus.* Of these the scrub tick (Plate 136, figs. 4 and 5) is the only one of importance, and at times may be responsible for heavy losses among flocks in ticky areas. *Ixodes holocyclus* is confined practically to the scrubs of the eastern coast, and not only is it regarded as a serious pest of sheep in these areas, but may also cause fatalities among dogs, cats, foals, calves, and even man. On sheep it is usually to be found on those parts of the body not covered by wool, but when very numerous may be located anywhere on the skin surface.

Life History.

The natural hosts of this tick are the native marsupials which are to be found in the scrubs. The tick is known as a three-host tick, which means that it drops from the host in order to undergo the moults which terminate one stage in the life cycle and commence another, reattaching itself to another host at the completion of the moult. The female when replete drops from the host on which she has been feeding, and after a period of about eleven to twenty days commences to lay her eggs, as many as 2,500 eggs being deposited. In warm weather the eggs hatch in from forty-nine to sixty-one days. The tiny larva or seed tick which emerges has only six legs (adults have eight), and, after remaining quiescent for about seven days, attaches itself to the first suitable animal that comes along and commences to feed. In four to six days the larva is fully fed, drops from the host, and seeks some sheltered spot, remaining there for nineteen to forty-one days, when it moults, and this time the first eight-legged stage appears—the nymph. The nymph in its turn attaches itself to another animal, and after feeding for four to seven days, drops to the ground and moults again at the end of another twenty-one to seventy-one days. This time the moult produces the adult tick, which in another seven days commences seeking for the final host.

Injury.

The danger of scrub tick attack lies in the possibility of the inducement of a condition of paralysis. Such a condition is produced by the mature female tick and possibly also by the nymph, and apparently requires at least five days of attachment. The actual cause of this paralysis is unknown, but it is thought to be due to a toxin which is secreted in the salivary glands. Recovery may be possible providing the condition is not too far advanced and the ticks removed, but, generally speaking, once paralysis becomes evident the animal dies.

Control.

Scrub ticks appear to be abundant mainly during the spring months, and during these months short-interval dippings may be found advantageous when small flocks are concerned. The clearing of all scrub as far as practicable and the elimination of the marsupial hosts from the areas grazed by sheep is one of the first steps in the control of this tick.

Dipping.

Several good proprietary dips are on the market, the arsenical dips giving the best results. Sheep should be dipped as soon as they have

recovered from the shock and knocking about of shearing, and when the wool is long enough to hold the dip—say, about four to six weeks off shears. Since lice, keds, and ticks live on the skin surface and in the fleece, the infested animals need not be held in the dip longer than is necessary to wet the fleece and exposed surfaces. About one minute in the dip is usually considered long enough to wet the animals thoroughly. The heads of all the sheep should be pushed or ducked under the surface long enough to ensure complete wetting. Sheep should not be rushed through the dip.

The number of gallons required to charge a dip may be computed in the following manner:—Add together the length at the dip line and the length of the bottom and divide by two. This gives the average length. Obtain the average width in the same manner, and multiply the average length by the average width in inches and the product by the depth. Divide this by 231, and the result will be the approximate number of gallons required. As each sheep when freshly shorn will carry out about 2 quarts of dip, the quantity carried out and retained by the animals plus the quantity required to charge the dip will be a fair estimate of the total quantity of dip required.

Adverse conditions at the time of dipping can and do have a detrimental effect on the result. These are, however, sometimes beyond control, but by using a dip of unvarying and guaranteed consistency, good results will be obtained. The care and condition of sheep before and after dipping are matters which should not be overlooked.

Sheep should not be dipped during extremes of heat and cold, when thirsty, or when in a heated state from driving. They should be yarded overnight and dipped early next day, so that they may have abundant time to dry before nightfall. When ewes and sucking lambs have been dipped, the lambs should be kept apart for some time after dipping. Dipping on cloudy days is not advisable, as the sheep take a long time to dry and are exposed to the risk of rain, which would decrease the efficacy of the treatment to a large extent.

In conclusion, it may be pointed out that failure to maintain a flock free from external parasites in spite of regular dippings and spelling of yards, &c., may be due to (1) carelessness in mixing the dip; each maker supplies certain instructions with his dip which should be followed implicitly; (2) rushing the sheep through the dip so that each animal fails to get thoroughly wet; (3) failure to make a complete muster; (4) failure to ascertain whether sheep bought between dippings and mixed with the flock are clean or otherwise; and (5) the admission of strangers among the flock through broken boundary fences, &c.

Dip Formula.

Arsenic	2 lb.
Sodium carbonate (washing soda) ..	2 lb.
Water	100 gallons.

THE SHEEP BLOWFLIES.

Blowflies are generally regarded as species of flies which blow or lay their eggs on carrion, so, in the ordinary course of nature, acting as scavengers, and helping in this way to get rid of offensive materials in a rapid and efficient manner. Some of the species, however, have

developed the habit of utilising live flesh for this purpose. In the case of short-haired animals, such as cattle and horses, blowfly attack occurs only when wounds and abrasions are present to attract them; but in sheep, on the other hand, the soiling of the thick wool is in itself sufficient to attract the flies and induce "blowing." Wounds, of course, also play their part in the inducement of strike, the infestation of the flesh-cracks and bruises on the head of the ram caused through fighting, and of the tail of the lamb after marking, furnishing good examples.

The conditions predisposing sheep to blowfly attack are as yet imperfectly understood, but it is fairly evident that, before blowing will occur, the wool attracting the flies must have a certain degree of moistness. The crutch and pizzle wool, where fly attack is usually most general, is made attractive to the flies through soiling with excreta and urine. Wool made moist from dew and rain, and even from the saliva of the sheep when it has been biting at some irritation, may also be struck.

The Species of Blowflies Concerned.

In Australia twelve species of blowflies are recorded as attacking sheep, but only some of these are of importance in Queensland. These sheep blowflies belong to the super-family Muscoidea. *Sarcophaga froggatti* Taylor is a member of the sub-family Sarcophagidæ, or flesh flies, the majority of which breed in carrion, though some species infest excreta, and one is a useful parasite of grasshoppers. The Sarcophagidæ may be readily recognised by their striped thorax and checkered abdomen. *Sarcophaga froggatti* was originally obtained from wool-infesting maggots at Winton. A second species of sheep blowfly to be found in Queensland is known as *Peronia rostrata* R.D. This is a shining dark-blue fly belonging to the family Anthomyidæ. Flies of this family also breed in excreta and decaying vegetable matter. Little is known of the biology of *Peronia rostrata*, but it appears to have been bred only from sheep on which "blowing" was well advanced.

The remaining species belong to the sub-family Calliphorinæ, family Muscidæ, a family of flies of widely divergent habits, including, besides blowflies, such species as the house fly, stable fly, and buffalo fly. The Calliphorinæ are to be found breeding mainly in flesh. The six species of this sub-family attacking sheep in Queensland are *Lucilia cuprina* Weid., *Calliphora auger* Fabr., *Calliphora stygia* Fabr., *Chrysomyia rufifacies* Macq., *Chrysomyia micropogon* Bigot, and *Microcalliphora varipes* Macq.

Lucilia cuprina Weid.—This is a comparatively slender and bristly fly (Plate 137, fig. 4), about four-tenths of an inch in length. There is a fair amount of variation in size, which appears dependent upon the amount of food consumed by the larva or maggot. The colour is usually a bright metallic green, but varies to a certain extent, and at times may be almost uniformly bronzy, but it always shows a tinge of green and a characteristic metallic lustre.*

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* There are two species of Lucilia concerned in strike—namely, *L. sericata* and *L. cuprina*, both of which were previously included under the one name, *L. sericata*. *L. cuprina* is the more important of these two species in Queensland, as *L. sericata* does not appear to extend further north than about Brisbane, and is unknown in the West. Both are introduced flies.

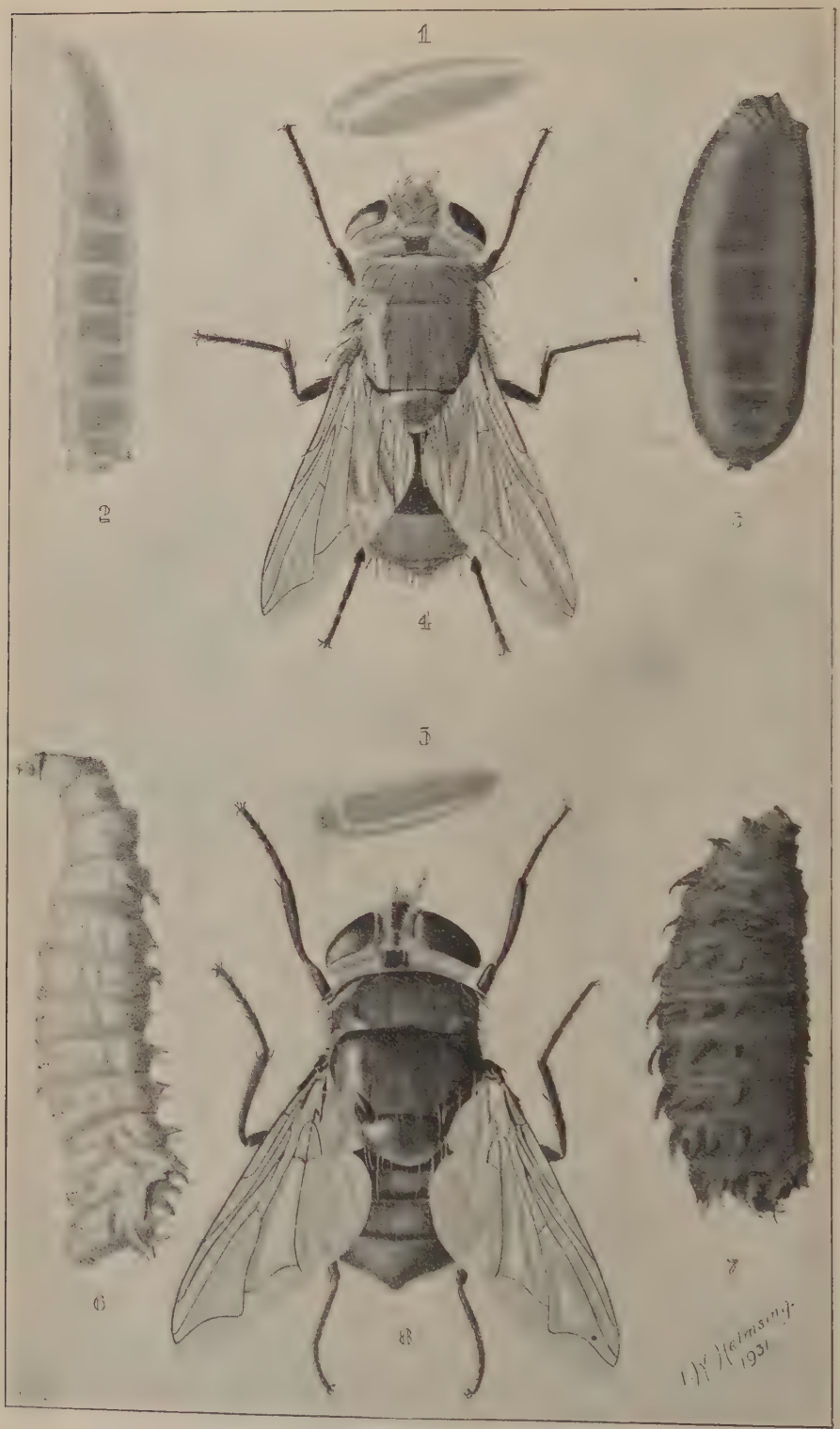

PLATE 137.—SHEEP MAGGOT FLIES.
(*For description of Plate see page* 345.)

Calliphora auger Fabr.—This is the smaller yellow blowfly which frequently comes into the house to blow meat. It may be readily recognised by the blue abdomen, deeply blotched on either side of the basal segments with yellow, so that the middle and apical portions of the abdomen are blue. The blue on the apical segments is somewhat obscured by a pale-yellow dust. The thorax is blue-grey, and the legs reddish-brown. This fly is a rather stout species measuring about one-third of an inch long.

Calliphora stygia Fabr.—This species is the larger yellow-bodied blowfly, which, like *C. auger*, frequents houses, and attracts attention by its persistent buzzing and boisterous flight. The insect is somewhat variable in size, but well-developed specimens may measure up to half an inch in length. The thorax is bluish-grey with a lighter under-surface, and yellow legs. The abdomen is greenish tinted, dusted with yellow, the whole of the upper surface clothed with short black hairs. The and yellow legs. The abdomen is greenish tinted, dusted with yellow, of the abdomen, give the fly a distinctly golden appearance. At least eight distinct species—all very similar in appearance to *C. stygia*—have been recognised, of which the Western Australian *C. australis* is one.

Chrysomyia rufifacies Macq.—This species is a comparatively robust fly (Plate 137, fig. 8), measuring about one-third of an inch in length. The colour is a uniform metallic blue, sometimes with a tinge of green, and sometimes bronzy like *Lucilia cuprina*. The colour is deeper on the edges of the abdominal segments to give the fly a distinctly banded appearance. If examined closely, very few bristles will be detected. *C. rufifacies* at times bears a strong resemblance to *Lucilia cuprina*, but may be readily recognised by its more robust appearance, prevailing bluish colour, the presence of the narrow bands across the abdomen, and the comparative lack of bristles. Both of these species may at times be confused with the greenish fly (*Pseudopyrellia* sp.) so frequently seen in large numbers around fresh cow dung. This species is not a blowfly, and its green colour soon turns to a bright blue-violet after death, while the colours of the two blowflies remain constant.

Chrysomyia micropogon Bigot.—In size *C. micropogon* approaches that of the smaller house blowfly, *C. auger*. It may be readily recognised by its large reddish-brown eyes, yellow face, uniform metallic dark-blue colour, and black legs.

Microcalliphora varipes Macq.—This is the smallest species of the blowflies infesting sheep, being about half the size of the house fly and

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SHEEP MAGGOT FLIES.

Description of Plate 137.

Lucilia cuprina Weid.

Fig. 1 .. .. Egg x 23.
Fig. 2 .. .. Larva x 7.
Fig. 3 .. .. Puparium x 7.
Fig. 4 .. .. Adult x 7.

Chrysomyia rufifacies Macq.

Fig. 5 .. .. Egg x 23.
Fig. 6 .. .. Larva x 7.
Fig. 7 .. .. Puparium x 7.
Fig. 8 .. .. Adult x 7.

somewhat more robust, due to its comparatively large head. Its colour is bright metallic green, with a pale-yellow face and mottled legs.

Life History Notes.

There seems to be no distinct strain of flies that attack sheep, for such flies that attack sheep will readily lay their eggs on meat, and, on the other hand, flies that have been reared on meat will oviposit on the wool of sheep. The period of development of the eggs and larvæ on the sheep is much the same as that in meat, and such of the life histories of Queensland sheep blowflies as are known have been for the most part obtained by rearing the larvæ in meat.

The life histories of the several species are very similar, differing only in detail. It is, therefore, proposed to deal thoroughly with the life history of only one species—*Lucilia cuprina*—mentioning that of the others only by way of comparison. This fly has been chosen, as it is probably the most important sheep blowfly, and has received a good deal of attention from various workers.

The Egg.

The female fly lays her eggs in some sheltered spot in the meat or in the wool. As many as 250 eggs (which are heaped together in a sticky mass) may be laid at one time. A single female, during her lifetime, may lay 1,000 eggs or more. The newly-laid egg (Plate 137, fig. 1) is white in colour, and somewhat sausage-shaped. In some of the species—*Calliphora auger* and *Calliphora stygia*—the egg at times is retained in the body of the female until it hatches, and is then deposited as a tiny maggot. In summer time the eggs may hatch within sixteen hours, but in midwinter may take as long as three days, or even more in a very cold climate.

The Larva.

From the egg comes the tiny, legless maggot of the fly. The maggot (Plate 137, fig. 2) is of an elongate conical shape, pointed at the anterior end and divided into a number of segments. The maggots of the majority of blowflies are smooth in appearance and whitish in colour, but those of *Chrysomyia rufifacies* (Plate 137, fig. 6) and *Microcalliphora varipes* are brown and so covered with erect tubercles as to give them a hairy appearance. In feeding, a slimy fluid is emitted from the mouth, and the wet and soiled appearance of infested wool is partly due to this fluid, which rots the wool fibres. They feed in squirming masses with the pointed head end immersed in the liquefied meat and their blunt hind ends raised above the surface. At this end there is a pair of openings, known as spiracles, through which the maggots breathe. The necessity of keeping these spiracles clear of the fluid is evident, else the maggots would perish.

In the warmer months the maggots feed rapidly, and are fully fed in four days. In the winter time they feed much more slowly, and may not be fully fed for seven days or more.

The Prepupa and Pupa.

When fully fed, the maggot crawls away from the meat or drops from the sheep, burrowing into the earth to seek protection from birds and parasites. Here it lies motionless for about two days in summer or for twenty-two days or more in winter, preparing for the commencement

of the great change in its life, from which it will emerge as the adult fly. This quiescent period is known as the prepupal or larval resting period. Gradually the maggot shrinks and its outer skin becomes hardened and turns brown. Inside this hard brown coat or puparium (Plate 137, fig. 3) the whole of the larval tissues break down into a creamy mass, from which the adult structures—the body, legs, and wings—are rebuilt. This is the pupal stage, and may last only six days in summer or as long as seventeen days or more in winter.

Duration of Life Cycle.

From the foregoing it will be seen that in summer time the life cycle of *Lucilia cuprina* may be completed in thirteen days and in winter in forty-nine days or more. For *Chrysomyia rufifacies* and *Microcalliphora varipes* the respective periods are nine and thirty-six days, and *Calliphora auger* seventeen and thirty-three days. The life-cycle periods of the remaining species are incomplete, but summer conditions are said to induce the emergence of the adult *Sarcophaga froggatti* in twenty-two days, and of *Chrysomyia micropogon* in twelve days. In the spring *Calliphora stygia* takes about thirty days for its life cycle, and *Peronia rostrata* twenty-six to forty-three days.

The life-cycle periods given above were obtained in Brisbane. It is probable that the western climate of Queensland would be conducive to a good deal of variation in the respective periods, especially in the winter, when the life cycle may extend over a period of several months.

The Adult.

The imprisoned fly, when ready to emerge from the pupa, is able, by means of a pulsating bladder-like organ on the front of its head, to push off the end of the puparium or hard pupal case and work its way to the surface of the soil.

On emerging the fly is very soft and drab in colour. It makes its way to some sunny spot, where it spreads its wings and raises them up and down to facilitate drying. After a while the bladder is withdrawn into the head, the body and wings dry, the colours of the body become evident, and the insect (Plate 137, fig. 4) is ready to fly off and commence its adult life.

Little has been published of the biology of the adult flies, but certain data concerning their range of flight and longevity is available.

It has been shown that the range of flight of the blowfly *Chrysomyia rufifacies* is at least 10 miles, which can be traversed in about twelve days. This means that flies breeding in a carcase may be distributed over a tract of country 20 miles in diameter—an area of 314 square miles. The flight of the flies is usually with or slightly across the wind, but carrion may be followed against a slight breeze.

The length of life of the adult or fly stage of *Chrysomyia rufifacies* in the field has been determined as at least twenty-eight days. Under conditions of captivity, *Lucilia sericata*, which is very similar to *Lucilia cuprina*, has been kept alive for seventy-seven to ninety-one days.

Why " Strike " in Sheep Occurs.

Various theories have been advanced to explain blowfly infestation of sheep, but the modern viewpoint indicates two factors as being mainly

concerned. First of all, although there are several species of blowflies which attack the sheep, many of these may be present without "strike" being evident. Observations have shown that the sheep blowflies may be divided into two groups mainly according to the manner in which they react to carrion. If an animal dies certain species are immediately attracted to the carcase and lay their eggs. These flies are induced to oviposit only while the flesh remains comparatively fresh. Once it has reached a certain stage of decay it is no longer attractive to them. After the maggots of these flies have been at work for some time the carcase is then rendered suitable for oviposition by other species of flies. Thus the carrion-feeding blowflies become divided into *primary* and *secondary* flies, the primary flies including those species which visit the carcase first and are only attracted while the flesh remains comparatively fresh. Moreover, infestation of carrion by the maggots of the primary flies is considered to be necessary before the secondary flies can be induced to oviposit. That is, the primary flies' maggots, in some way or other, render the carrion suitable as food for the maggots of the secondary flies. In the total absence of these primary flies the carrion may not be infested with blowfly maggots to any marked extent, and may simply dry up. *Lucilia cuprina* and the two species of *Calliphora* are primary flies, whilst *Chrysomyia rufifacies* and *Microcalliphora varipes* are secondary flies.

In the case of blowing of sheep these two groups of flies play a similar part to that enacted with carrion. Strike is initiated usually only by the species of *Lucilia* and *Calliphora*, and previous infestation with the maggots of these flies is necessary before the hairy maggots of *Chrysomyia rufifacies* and *Microcalliphora* are seen. The position with regard to *Chrysomyia micropogon* is not known to any degree of certainty. It is believed that this fly is secondary to a certain extent, but that in the presence of wounds and abrasions which have reached a certain stage of decay its maggots are able to exist without the previous presence of maggots of the primary flies. In most cases, however, strike can be initiated only by the primary flies, and in their absence very little blowing of sheep would be evident.

The second factor necessary to induce strike is that not only is the presence of a species of one of the primary blowflies required, but the sheep must be attractive to the flies to an extent sufficient to induce them to lay their eggs. The parts of the body most favourable to the flies, not taking into account the presence of wounds, are the crutch and adjacent areas in ewes, around the pizzle in wethers and rams, and occasionally the shoulders and other parts of the body which, under certain conditions, are kept moist. It is now considered that this attractiveness to the flies is associated with bacteria which are present in the fleece and on the skin surface, and which under certain conditions, of which the presence of moisture is probably the most important, increase and render the sheep attractive to the flies. Heavily-wrinkled sheep are especially attractive, for the body folds, by retaining the body secretions and any moisture, are areas in which these bacteria develop and increase very rapidly. Strike on portions of the body such as the shoulders and back are associated with a condition of the fleece known as "water rot," which is caused by certain bacteria in the presence of constant dampness.

Control of Sheep Blowflies.

Trapping and carcase treatment have in the past been given greatest prominence as measures to be adopted for blowfly control.

Trapping.—To be successful the majority of flies caught by trapping should be primary flies. Unfortunately, however, most of the flies trapped are secondary, due to the fact that primary flies are only attracted to the bait whilst it remains comparatively fresh. Little result can therefore be expected from trapping unless a bait can be discovered which will remain attractive to the primary flies over a comparatively long period.

Carcase Treatment.—Carcase treatment is necessary from a sanitation standpoint, but it is questionable whether it has any influence towards the control of strike. Some slight control by carcase treatment may be expected only if the carcase is treated within about three to four days of death. This would kill the maggots of the primary flies breeding there, but if the treatment is delayed any longer than about three or four days these maggots will no longer be present, and those destroyed will be the progeny of the secondary flies; in which case such delayed treatment may do more harm than good so far as the control of strike is concerned. It has already been pointed out that the primary flies visit the carcase first and their maggots are at work shortly after death. The carcase is then invaded by the secondary flies whose maggots not only render the flesh unsuitable for the primary fly maggots, but, being more robust, are more successful in the competition for the available food. As a result a good percentage of the primary fly maggots are driven from the carcase and die. Thus it will be seen that these secondary flies act as a control on the numbers of primary flies, and a wholesale destruction of their maggots might possibly result in an increase in the numbers of the primary flies upon which initiation of strike depends to a large extent.

Carcases are best treated by burning or by the careful application of a poison dip powder containing arsenic to all portions. The part of the carcase in contact with the ground must receive special attention.

Jetting.—Jetting will give immunity from "strike" for a period of four to six weeks. The following formula was found by the Department of Agriculture, New South Wales, to be more satisfactory than any other that was used:—

White arsenic	10 lb.
Stone lime	10 lb.
Caustic soda	1 lb.
Water	100 gallons.

The pressure used should not exceed 150 lb. to the square inch, otherwise the skin may be injured.

Dressings.—There is no dressing yet known which may be regarded as entirely satisfactory, but the following are recommended:—

(1) ½-1 oz. Paris green, 6-8 oz. Kaolin, 18 oz. soft soap solution (·5 per cent. strength).

(2) Five per cent. watery solution of zinc sulphate.

(3) Four per cent. phenol crystals in whale oil.

(4) Five per cent. watery solution of Monsol.

INTERNAL PARASITES.

The internal parasites of the sheep comprise tapeworms, a fluke, several species of roundworms, and one other form, the nasal fly.

THE SHEEP NASAL FLY (*Oestrus ovis* L.) (Fig. 1 (a) and (b)).

Description and Life History.

The adult sheep nasal fly (fig. 1 (*a*)) is a squat greyish fly which appears during the spring and summer months. The fly deposits a tiny grub on the edges of the nostril which makes its way up the nostril and sometimes into the communicating cavities. The presence of the fly often causes the sheep to become frantic in their efforts to prevent the fly attacking them, and they generally hold the nose against the ground or some other sheep when the fly is about.

FIG. 1 (*a*).

FIG. 1 (*b*).

PLATE 138.

The larvæ or grubs (fig. 1 (*b*)) are provided with a strong pair of mouth hooks and the body is encircled with rows of spines. By means of these mouth hooks the larva maintains its position in the nostrils feeding upon the discharges its presence occasions. When fully grown the larva measures up to four-fifths of an inch in length, and is yellowish in colour with black bands on the dorsal surface. It then leaves the nostril, usually being sneezed out by the sheep, and upon reaching the ground burrows below the surface and pupates. The outer skin hardens, becomes leathery, and turns black. From the pupa the adult fly eventually emerges.

Effect on the Sheep.

The presence of the grubs in the nostril produces an irritation resulting in a discharge which becomes thickened and discoloured, presenting the condition known as "snotty nose." The animal frequently sneezes and in heavy infestations its breathing may be seriously interfered with. The eyes may become inflamed and the sheep may continually move its head about as though endeavouring to rid itself of the obstructions in the nostrils. The appetite is impaired and the animal may lose condition. Death due to nasal fly is not very common, but the grubs have been seen in the brain.

Control.

Treatment is not very satisfactory and control depends almost entirely on preventive measures. The best of these consists in boring small holes about 2 inches in diameter in the bottom of the salt troughs. Salt is placed in these holes, the edges being heavily tarred with pine or Stockholm tar so that the sheep get the tar on their nostrils as they lick the salt. The tar acts as a repellent and prevents the fly depositing larvæ in the nostrils.

TAPEWORMS.

Two larval tapeworms occur in the sheep—the bladder worm, *Cysticercus tenuicollis*, and the hydatid worm, *Echinococcus granulosus*. *Cysticercus tenuicollis* is the bladder worm so frequently encountered in the body cavity of the sheep. It is sometimes also seen in the liver. The adult tapeworm, known as *Taenia hydatigena*, occurs in the dog, which becomes infested only when it eats a portion of the sheep containing a bladder worm.

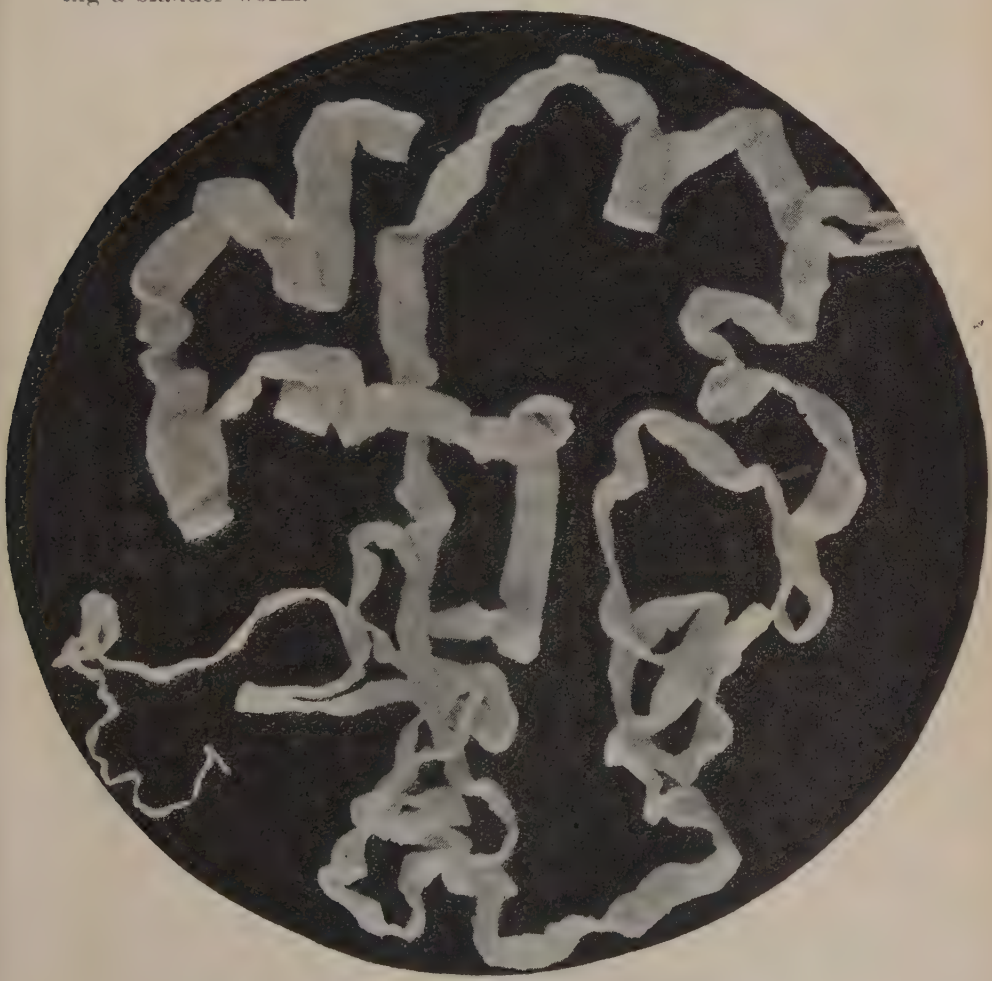

PLATE 139.

FIG. 2. TAPEWORM (*Moniezia expansa*). Natural size.

The hydatid larva, *Echinococcus granulosus*, is usually found in the liver and lungs. The adult tapeworm also occurs in the dog, the life history being similar to that of *Taenia hydatigena*.

Of these two larval tapeworms, the most important is the hydatid worm, as it may also occur in man. Prevention consists in not feeding raw offal to dogs, as this may contain the larval forms. Dogs should also be kept as free of the adult tapeworms as possible by treatment with an efficient drug.

Adult tapeworms are found in the small intestine of the sheep, more especially in lambs. Two species are known to occur in Queensland—*Moniezia expansa* (Fig. 2), which is very common, and *Halictometra giardi*, which is much less frequently seen. Both these species are whitish to yellowish in colour and may attain a length of many feet. *Moniezia expansa* (fig. 2), which is very common, and *Halictometra* of both these species are unknown, and preventive measures cannot therefore be outlined. Lambs infested with tapeworms become unthrifty, weak, and emaciated, diarrhœa being frequently manifested. Diagnosis is readily made by examining the fæces in which tapeworm segments will be seen.

Treatment consists in starving overnight, and next morning each lamb is given 1 to 1½ fluid ounces of the following formula:—

White arsenic (containing not less than 95 per cent. arsenious acid)	2 oz.
Epsom salts	6 lb.
Water	5 gals.

Boil the arsenic for half an hour in two gallons of water; allow to cool and sediment. Pour off and retain the clear liquid; add the Epsom salts, and make up to 5 gallons.

FLUKE.

Only one species of fluke occurs in the sheep in Australia—namely, the liver fluke, *Fasciola hepatica*. This parasite is found in the bile

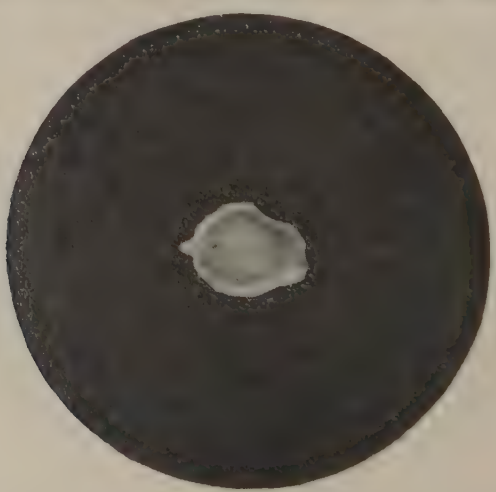

PLATE 140.

FIG. 3. THE LIVER FLUKE (*Fasciola hepatica*). Natural size.

ducts of the liver, and in the Southern States is a serious parasite. Although it is found in one or two districts in Queensland, it is only of minor importance in this State.

THE LARGE STOMACH WORM.

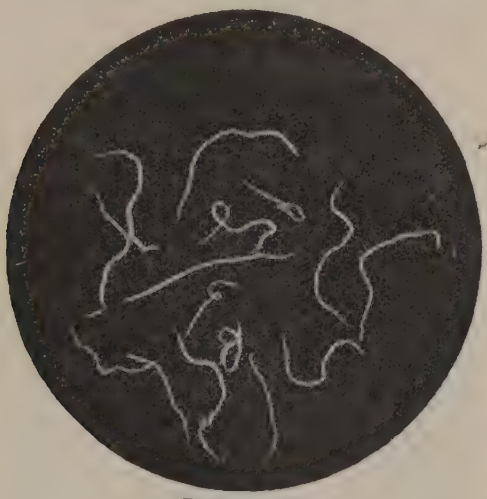

Plate 141.

Fig. 4. The Large Stomach Worm (*Haemonchus contortus*). Natural size.

Description.

This worm is found in the fourth stomach, and is undoubtedly the most serious parasite the Queensland sheepman has to contend with. The appearance of the parasite is very distinctive, as the female is spirally striped, resembling in general a barber's pole. The male is smaller and uniformly whitish or pinkish.

Life History.

The eggs laid by the female worms pass out in the dung, and under favourable conditions of temperature and moisture hatch in a few hours. The young larva, on emerging from the egg, feeds in the dung, and during its development casts its skin twice. After the second moult, however, the cast skin remains as a closely-fitting sheath and assists in protecting the larva against such adverse conditions as dryness. This ensheathed larva is the infective stage, and it is only by swallowing the ensheathed larva that the sheep can become infested. When the grass is wet with dew or rain this larva crawls up the grass blades and is eventually consumed by the sheep as it grazes. In the fourth stomach the tiny worms grow rapidly, and after about four weeks are fully mature and laying eggs.

Effect on the Sheep.

Stomach worm infestation is serious, and if left untreated, heavy mortalities may occur. Such symptoms as periodic scouring, bleaching of the skin and mucous membranes of the eyes and mouth, bottle jaw, tucked-up flanks, and a rapid loss of condition accompany infestation with this round worm. Stomach worm is most serious among lambs, especially weaners, and lambing ewes.

Treatment and Control.

For the removal of the large stomach worm, carbon tetrachloride or bluestone is highly efficient. Carbon tetrachloride is given in doses of 2 cubic centimetres for adults and 1 cubic centimetre for lambs in 3 and 4 cubic centimetres respectively of liquid paraffin. This drug is regarded as being more efficient than bluestone, and much easier to administer, as the dose is very small and does not require, moreover, previous starvation. In certain classes of country and under certain conditions not yet quite understood, however, sheep may not tolerate this drug, and even a very small dose may have serious and even fatal results. It is essential, therefore, that where carbon tetrachloride has never previously been used, that only a few sheep be treated at first and the effects of its use carefully noted. Frequently this intolerance is due to a calcium deficiency, and sheep running on country deficient in this element should be given a calcium lick for some time before treatment.

On the whole, bluestone may be regarded as a safer drench than carbon tetrachloride, though not so effective nor so easy to administer. It may be given alone or with an equal quantity of mustard. The addition of the mustard is considered to increase the efficiency of the treatment, but at the same time, it must be pointed out, considerably adds to the cost as well. Starvation overnight is necessary, and should be continued for about four hours after drenching. Only fresh (blue) bluestone should be used, and any white powdery material should be discarded. The bluestone should be mixed in an enamel or earthenware vessel, so that it cannot react with a metal surface, which would decrease its effectiveness.

Formula.

Bluestone	1 lb.
(Mustard)	(1 lb.)
Water	5 gals.

Dose.

Adults	2 fluid oz.
Lambs	1 fluid oz.

On holdings which are heavily infested, only treatment at regular intervals will hold the worms in check. During the summer months, treatment at monthly intervals is essential, especially towards the autumn. At least one drench is desirable about midwinter and another at the end of the winter, about September.

As the lambs and lambing ewes are usually most seriously affected by infestation, any control measures that are considered practicable should especially concern these two classes of sheep.

Marshy areas and other low-lying paddocks should, if possible, be used for the older sheep, wethers and aged ewes.

Burning-off the pastures will destroy a big percentage of the free living stages in the grass. Such burnt-off paddocks are comparatively safe for young sheep which, however, should be drenched before being placed there. It is a good idea to reserve such a paddock for the use of the weaners only, which, of course, must be drenched just before they are taken from the ewes. Heavy stocking makes stomach worm control very difficult, and on heavily infested holdings it is advisable to go to the other extreme and under-stock until there is some definite degree of

control obtained. In cases where paddocks can be left vacant, no sheep or cattle should be allowed to graze for at least six months, and at the end of this period such paddocks may be considered safe for stocking with clean sheep.

Finally, the provision of suitable licks and, where possible, the top-dressing of pastures, should be given consideration, as the improved health of the sheep resulting from these practices enables it to resist the effects of infestation to a conspicuous extent.

LESSER STOMACH WORM.

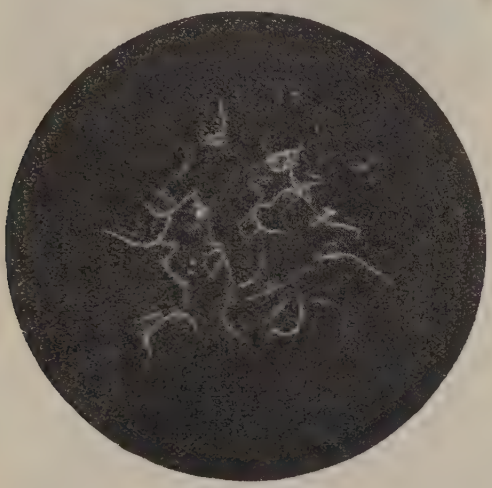

Plate 142.

Fig. 5. The Lesser Stomach Worm (*Ostertagia circumcincta*). Natural size.

Besides *Haemonchus contortus*, the fourth stomach may be inhabited by a smaller brownish species, *Ostertagia circumcincta*, which lies just under the mucous lining. This parasite, though fairly common, does not occur in large numbers and is not considered to be of any economic importance in Queensland. The life history is similar to that of the large stomach worm.

SMALL TRICHOSTRONGYLES.

Description.

These are very tiny, hair-like worms, reddish in colour, occurring mainly in the first 15 to 20 feet of the small intestine. Their size makes them easily overlooked, and detection is only possible by a very careful examination of the intestine wall. They may be responsible for serious losses among lambs and are concerned with a diarrhœic condition known as "black scours." Their life history is practically the same as that of the large stomach worm.

Control.

In South Africa these worms are commonly known as "bankrupt worms" and are very aptly named. At present there is no drug which is efficient in removing them, though regular drenching with carbon

tetrachloride or bluestone may have some beneficial effect. These parasites, for the main part, affect only the lambs, and everything possible should be done to prevent the young sheep from becoming infested.

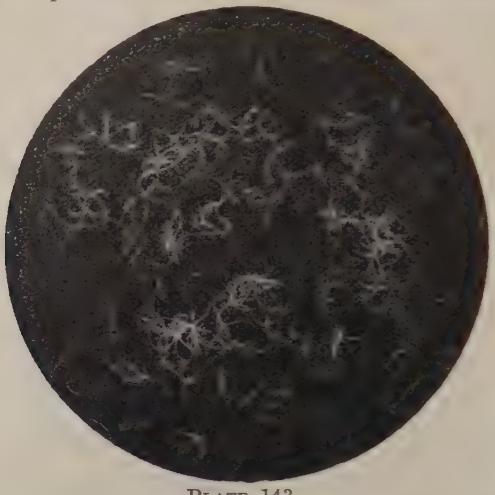

PLATE 143.

FIG. 6. SMALL TRICHOSTRONGYLES (*Trichostrongylus spp.*). Natural size.

The preventive measures recommended for the large stomach worm should be practised. In addition, the use of improved pastures, especially for the lambs, is of the greatest importance if breeding in areas where the small *Trichostrongyles* are present is to be continued.

THE NODULE WORM.

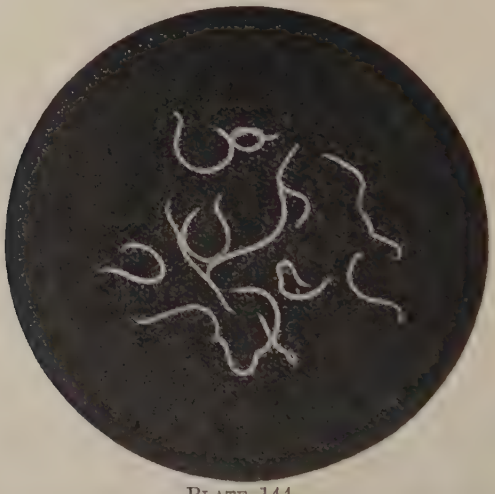

PLATE 144.

FIG. 7. THE NODULE WORM (*Oesophagostomum columbianum*). Natural size.

Description.

Of the species of roundworms that infest the intestinal tract, one of the most important is the nodule worm which is found in the large bowel. The adult worms are whitish in appearance, with the head end bent in the shape of a hook. The females may attain a length of five-eighths of an inch, the males being somewhat smaller.

Life History.

The life history in the dung results, as in the case of the large stomach worm, in an infective ensheathed larva which is taken in by the sheep whilst grazing. The larva eventually reaches the large bowel and burrows into the wall of the intestine. A nodule is formed around the larva, in which it lies for a minimum period of six to eight days. Leaving the nodule, the young worm moves into the lumen of the intestine and develops into an adult. Larvæ can be found only in the very small nodules, which in time increase considerably in size, and become filled with a hard, cheesy, greenish pus.

Effect on the Sheep.

A heavy infestation produces emaciation, general debility, and frequently continuous scouring. Young sheep are more affected, and in country showing nodule worm remain stunted and unthrifty.

Control.

Up to the present no satisfactory treatment for the disease associated with this worm is known, and the preventive measures already discussed for stomach worm are of the greatest importance.

THE WHIPWORM.

Plate 145.

Fig. 8. The Whip Worm (*Trichuris ovis*). Natural size.

Description.

Whipworms, *Trichuris ovis,* occur in the cæcum or blind gut and in the adjoining portion of the large intestine. The species may be readily recognised by its whip-like appearance, the lash being represented by the long, slender anterior part of the worm, while the thick posterior portion of the body is reminiscent of the whip handle.

Life History.

The eggs passed out in the dung develop into infective embryos, which, on being swallowed by the sheep, hatch and give rise to tiny larvæ. These larvæ make their way to the cæcum, where they grow to maturity.

Effect on the Sheep and Control.

Unless present in very great numbers, which is extremely rare, this species is not associated with any pathogenic condition. No satisfactory treatment is known, and the worms can be controlled only by preventive measures.

LUNGWORMS.

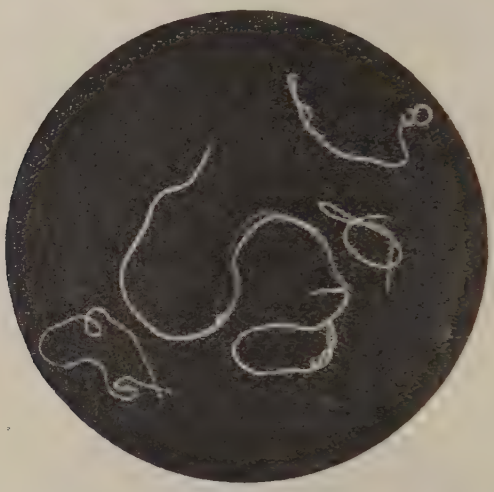

PLATE 146.

FIG. 9. THE LARGE LUNGWORM (*Dictyocaulus filaria*). Natural size.

Description.

There are three species of lungworms infesting sheep, but the only species of any importance in Queensland is the large lungworm, *Dictyocaulus filaria*. These are long whitish worms up to 3 inches or more in length, occurring in the air tubes of the lungs.

Life History.

The eggs, when laid by the female worm, contain a small active larva which hatches either in the lungs or in the alimentary canal. They are passed out mainly in the dung, but may also be coughed up or appear in the nasal secretions. In the open the larvæ, under suitable conditions of temperature and moisture, become infective, and are eventually swallowed by the sheep when grazing or drinking. They eventually reach the lungs either in the blood or lymph stream, settle down in the air tubes, and grow to maturity.

Effect on the Sheep.

A few lungworms do little harm, but when a heavy infestation is present the worms irritate the lung tissue, causing severe inflammation and the production of a frothy mucus. The bunches of worms obstruct the passage of air, and the animals show symptoms of difficult breathing. A frequent husky cough becomes evident, and the infested sheep may rapidly lose condition and die.

Control.

The following recommendations are given for the control of this parasite:—

(1) The greatest sources of infestation are pools of water and low-lying, marshy areas, and these should be avoided as sheep pastures in lungworm areas. In the case of an outbreak, any sheep in pastures of this nature should be immediately removed to a dry, well-drained, and sheltered paddock.

(2) Treatment with carbon tetrachloride or bluestone is advised. This has no effect on the lungworms themselves, but as lungworm and stomach worm infestations usually occur together, this treatment, by removing the stomach worms, increases the sheep's resistance to lungworm.

(3) It has been shown experimentally that infested sheep recover more rapidly by good nursing than by any other attempted treatment. Provide a good, safe water supply in troughing. See that the paddock is well shaded and sheltered, and supplement the grazing of the affected sheep with hand-feeding and suitable licks.

(4) Injection of certain drugs into the windpipe by means of a sterilised hypodermic syringe will give relief. The operation is not an easy one, however, and should be carried out under the supervision of the local stock inspector. The following formula will be found satisfactory, especially if three treatments are given at three-day intervals:—

Oil of turpentine	1 c.c.
Creosote	0·5 c.c.
Olive oil	2 c.c.
Chloroform	0·5 c.c.

A WIRE GATE.

There will be no difficulty in constructing this gate, which is an improvement on the "concertina" type.

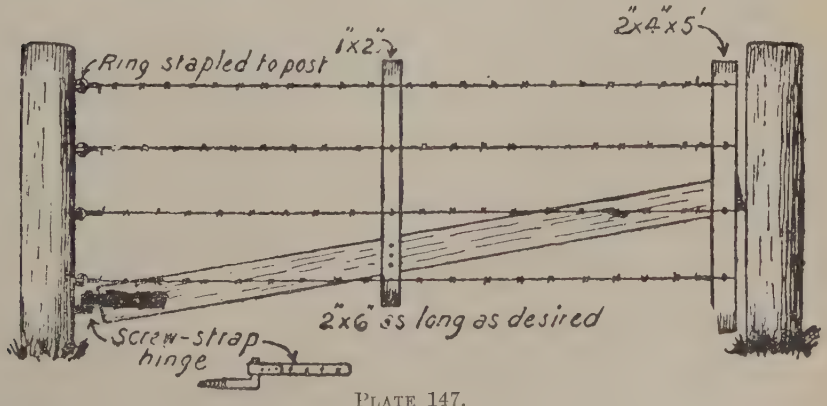

Plate 147.

Queensland Weeds.

By C. T. WHITE, Government Botanist.

NUT GRASS (*Cyperus rotundus*).

Description.—A grass-like plant producing numerous underground runners and tubers. The tubers globose or egg-shaped, mostly about ½-inch long, covered with a dark brown skin. They possess a white or cream-coloured flesh with a rather nutty, somewhat aromatic flavour. Leaves green, 4-6 inches long, the lowermost ones clothing the bottom of the shoot reduced to reddish brown sheathing bracts. Seed heads radiating and branching from the top of a green triangular stem 6 inches to a foot or more high, and subtended by three narrow leaves. Seed heads composed of a number of reddish-brown many-flowered spikelets. Seeds or nutlets chestnut brown, but apparently rarely if ever ripen in Queensland plants.

Distribution.—Nut Grass is a widely spread tropical and subtropical weed, and as it was collected in North Australia by Robert Brown in the very early years of the nineteenth century, it is reasonable to suppose that it is a native of Australia in common with other warm countries.

Botanical Name.—*Cyperus*—origin obscure, perhaps from Cypris, a name of Venus from the edible tubers of some species being supposed to have marked qualities as an aphrodisiac; *rotundus* (Latin) meaning round, referring to the globose tubers.

Properties.—Nut Grass has some value as a fodder and is readily eaten by all classes of stock. Pigs are especially fond of the tubers and on this account the practice of pasturing them on Nut Grass-infested areas is often adopted.

Eradication.—On the whole it may be stated that both in Queensland and in other countries poisonous sprays have proved of little or no value unless several applications are made. Experience has shown, however, that small patches can be eradicated by an application of cheap-grade salt at the rate of ¼ lb. per square foot, either dry or in the form of brine. Waste brine as obtainable from butchers, hide stores, &c., is quite suitable. Heavy applications of this type, however, render the land unfit for cultivation for a season, but the method is excellent for tennis courts, wide garden paths, &c., where the salt can do no harm. The best results are obtainable by applying the salt in hot, dry weather. In small areas one of the best methods of eradication is to keep the green growth constantly cut off, and this on the whole seems better than forking the land over. The Nut Grass tuber is a storehouse of nutriment for the young shoots. The food material stored in the tuber is used in the formation of the young shoots. Cut these off regularly and the tuber will eventually become exhausted. Another point is that the formation of fresh tubers is dependent upon the leaves, and if these are not allowed to grow fresh tubers cannot be formed and the old ones must die of exhaustion.

It has been recommended at odd times that small patches should be covered with galvanised iron or some such material, but this is of no value whatever as the Nut Grass tubers simply remain dormant, and spring into active life as soon as the covering is removed. Pigs and

Plate 148. Nut Grass (*Cyperus rotundus*).

poultry, including ducks, do good work in keeping the weed in check in small areas, and in confined places will in a few years completely eradicate it.

A great deal of hope has been raised at times of insects having considerable possibilities in the control of Nut Grass. An article on a Coccid (the family to which the scale insects belong) and a Mealy Bug was published by Mr. W. A. T. Summerville in the "Queensland Agricultural Journal" for October, 1933. After consideration of evidence gathered from time to time and from different localities, it is stated that either insect has little or no value in controlling Nut Grass in such places where Nut Grass would ever become a pest to the farmer.

Botanical Reference.—*Cyperus rotundus* Linnæus species Plantarum 45, 1753.

SOUR GRASS OR YELLOW GRASS (*Paspalum conjugatum*).

Description.—An extensively creeping grass covering large areas to the exclusion of other herbage. Leaves mostly about 5 inches long and ½ inch broad. Seed heads usually two at the top of a slender stem and spreading away from one another; very slender, 3-4½ inches long, with the small, rounded, yellow spikelets ("seeds") crowded in two rows on one side of each branch of the two seed heads. Individual spikelets ("seeds") round or slightly depressed on one side, convex on the other, and enclosing a shining, semi-translucent, straw-coloured grain; margins of the spikelet thickened and bearing a few long hairs.

Distribution.—A widely spread grass over the tropical regions of the world; originally described from Dutch Guiana, tropical South America.

Botanical Name.—*Paspalum* from *paspalos,* one of the ancient Greek names for the Millet; *conjugatum* (Latin), meaning coupled or united and relating to the two branches of the seed head.

Common Name.—In North Queensland generally known as Sour Grass or Yellow Grass. In the Hawaiian Islands, where it is also a weed, it goes under the name of Hilo Grass. In the West Indies it is known as Sour Grass.

Properties.—Wherever this grass grows it is looked upon as worthless as a fodder. It is a common weed under rubber trees in Papuan plantations and I have seen working mules eat it and in conjunction with other feed do quite well on it; no doubt they were driven to it by the absence of other green grasses and herbage. The grass has occasioned some concern in the wetter parts of the Atherton Tableland, due to its invading dairying pastures to the exclusion of Paspalum and other good grasses, rendering the pasture practically useless for milk production.

Control.—The only method of control that suggests itself is ploughing out and replanting with some smothering grass such as Giant Couch (*Brachiaria mutica*), Kikuyu or similar kinds, and spelling the paddocks so as to give the better grasses a chance to establish themselves in spite of the competition of the Sour Grass.

Botanical Reference.—*Paspalum conjugatum*. Bergius, Act. Helv. Phys. Math. 7, 129, 1762.

Plate 149. Sour Grass or Yellow Grass (*Paspalum conjugatum*).

Cotton Varietal Testing.

By W. G. WELLS, Director of Cotton Culture.

THE introduction of the system whereby the Commonwealth Government bounty will be on lint cotton rather than on the unginned seed cotton will probably necessitate a change over to the method of paying the growers for their lint rather than for the seed cotton they send in, which has been the basis used since the commencement of the present phase of cotton-growing in this State.

On account of this, many farmers will probably want to try out several varieties, especially some of the big-boll, high-lint percentage types, to see if they can increase their yields of lint per acre. The following descriptions of methods of testing varieties have therefore been written to acquaint growers with some of the precautions which have to be taken to insure that results of reliable value are obtained from varietal trials.

It is pointed out, however, that varietal testing, if carried out properly, is a more difficult procedure than most growers realise. Frequently requests are received for an allotment of several varieties so that a test can be made of their comparative suitability, and quantities of seed sufficient to plant as much as five or more acres of each are ordered, with the idea of planting single areas of each. It is advised, however, that yields obtained from only one plot of each variety do not present reliable evidence of their merits. It is very probable that in such single-plot tests, if the position of the varieties had been otherwise, entirely different results would have been obtained, unless, of course, varieties of decided differences in yielding ability were being tried.

Investigators of agricultural problems throughout the world have long recognised the dangers connected with judging the merits of varieties by results obtained from only one plot of each, and methods have been devised to eliminate as many influences as possible that might affect the validity of the conclusions drawn from an experiment. Mathematicians have clearly demonstrated that increasing the number of plots of each variety in a test, undoubtedly allows of a much better gauging of the merits of each one. In recent years marked progress has been made in improving the technique of varietal testing, particularly in regard to the estimation of the reliability of the results obtained. These methods have been used here in cotton investigations for some years, and have been found highly suitable for the conditions. Growers should, therefore, use them more extensively than is the case at present.

If a test consists of only one plot of each variety, the question arises as to how the yields are affected by the position of the plots. If the rows are planted across a slope, which is the correct way to help reduce soil erosion, the varieties in the top or bottom plots may have decided advantages or disadvantages, according to the seasonal conditions. In a dry season the bottom acre plot will have the advantage of the soakage from the rest of the experiment, and obviously the variety grown on it might yield outstandingly better than any of the others, whereas in reality it might actually have considerably less yielding ability when under comparable conditions. If several plots of each variety are grown, however, a much better sampling of the soil can be

obtained, provided the same order of location of each variety is not followed each time, such as ABCD, ABCD, ABCD. Obviously if the same order is used each time variety D will have the advantage or disadvantage in each group of comparisons, for it will always be on the low side of the others.

Latin Squares.

A method has been devised wherein as many plots of each variety are planted as there are varieties in the test, and the positions of the plots are such as to subject each variety to approximately the same soil influences. This plan is called a Latin Square, and for testing from four to six varieties it appears to be well suited to Queensland conditions. In such an experiment four rows of a variety are planted in a plot, with the plots arranged in one long face and the rows running across the field. This allows of the using of a two-row planter, for the one round trip plants a plot. By measuring off the width of the experiment and tagging the location of each plot of a variety with rags of the one colour, all the plots of one variety can be planted, then all the different tagged plots of another, &c., the experiment requiring only a small amount of extra work over regular commercial planting. At harvesting time the whole row may be picked for the experiment, or a section taken from across all plots on uniform average soil, where the most regular stand can be obtained.

The following experiment illustrates how four varieties are located —the data being from an actual test carried out in the 1933-34 season:—

PLAN I.

Block.	1				2				3				4			
Plot	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Number of Rows ..	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Variety	A	B	C	D	B	D	A	C	D	C	B	A	C	A	D	B
Yield lb. s/c.	35	31	35	43	25	49	44	42	41	35	26	48	36	35	34	26
Block Yield	144				160				148				131			
Block Yield on a per acre rate	1,162 lb. s/c.				1,291 lb.				1,194 lb.				1,057 lb.			

There were four rows in each plot of each variety, but only the cotton from the two middle rows of each plot was weighed, for it has been found that the first and last rows of a plot may be influenced decidedly by the adjacent variety. That is, if a tall rank growing variety is grown alongside of one of a smaller structure, the outside rows of both varieties may not give truly representative yields, hence in varietal testing the yields of the outside rows are not included in the results analysed.

It will be noted that although each variety occurs only once in each block of four plots in the experiment, there is a marked difference in

the block yields—Block 2 yielding at the rate of 1,291 lb. seed cotton per acre, whereas Block 4 yielded only at the rate of 1,057 lb. This shows clearly the variation in soil fertility that can exist in an experiment, and had only one variety been planted in each block, most misleading conclusions might have been drawn as to their merits. It is quite possible that B, the low-yielding variety, might have been planted by chance on the highest yielding block, if only one variety had been sown in each one. The superior yielding ability of the best block would therefore have given the low-producing cotton an advantage over the others, and thus might have put it in the lead, whereas in reality with a repetition of several plots, it was shown to be decidedly the lowest yielder.

If the plot yields of the included test are grouped as in Table I., the variation in plot yield within the one variety is shown—yet it will be noted that variety B is consistently lower than any of the other varieties in each block. The results are obviously of much more value, therefore, for this variety has yielded the lowest in all four comparisons, whereas if only one block of each variety had been planted this variety might have been in the lead.

TABLE I.

PLOT YIELDS OF EACH VARIETY (2 INNER ROWS $= \frac{1}{32 \cdot 27}$ of an acre.)

A	B	C	D
35	31	35	43
44	25	42	49
48	26	33	41
35	26	36	34
*40·5	*27	*36·5	*41·75

* Mean yield in lb. of seed cotton.

It can thus be seen that it is necessary to have several plots of each variety in order to obtain a thoroughly representative sampling of the soil on which the experiment is being conducted.

Lint Yields.

It has been shown how necessary it is to have accurately determined results before the yielding ability of a variety, in terms of seed cotton per acre, can be determined. With the payment of the bounty on lint cotton, it becomes all the more imperative to ascertain the true yielding ability of a variety, for the main varieties being grown in Queensland range from slightly over 32 per cent. lint up to 40 per cent. under average conditions. On some soils a variety producing 39 per cent. lint may yield less seed cotton than a low lint per cent. variety, and yet the amount of lint produced, due to the higher lint percentage, may make the former variety a more valuable one to the grower. It does not follow, however, that a variety with a high lint percentage will always produce more lint or greater monetary returns per acre

than will a variety with a low lint percentage. This is amply demonstrated in the experiment that has been used to illustrate the points made in this article, as is shown in Table II.

TABLE II.

Variety.	A	B	C	D
Yield per acre lb. s/c.	1307	871	1178	1347
Yield per acre lb. lint	423	340	448	488
Lint percentage	32·4	39	38	36·25

It will be noted that varieties A, C, and D produced more seed cotton and lint per acre than B, although they had a lower lint percentage, A being only 32·4 per cent. as compared to 39 for B. This experiment was carried out on alluvial clay loam where varieties of the type of B are not suited, especially in seasons of heavy rainfall at mid-crop. In the drier districts such a variety, which is of the drought-resistant type, has much more promise of producing the highest yield of lint per acre.

Randomised Blocks.

Where three or more than six varieties are to be tested, it is advisable to use the method known as Randomised Blocks, for with three varieties there are not enough plots in a Latin Square, and with more than six varieties a Latin Square becomes too cumbersome, for there would be thirty-six plots when testing six varieties, as each variety has to be repeated as many times as there are varieties. With three varieties four or more plots of each are preferable, while with over six varieties four plots of each are ample to measure fairly small differences in yielding ability if the soil is at all uniform. The main feature of a randomised block experiment is that it is much more elastic than a Latin Square, although it does not measure small differences in yields with quite such precision. A farmer with a 100-acre field of varying fertility in the different portions may use a randomised block experiment to ascertain the most suitable of several varieties for the whole of his field, by planting a block consisting of one acre of each variety in several places in the field. The yields obtained from each acre plot can be combined into one experiment for analysis to ascertain if any one of the varieties gives a definite indication of being the most suited on the average for that field.

Likewise, varieties may be tested for a subdivision of a district, by each of eight or ten growers planting equal areas of all varieties being tried. All the growers must plant at the same time, however, use the same cultural methods, and carry out comparable standards of cultivation, otherwise there will be so many variable factors affecting the results that the main question—Which variety is the most likely to yield the best on the majority of the soils in the area?—cannot be answered. The Cotton Section of the Department of Agriculture is using this method in conjunction with Latin Squares, in order that all soil types in a district may be sampled, and a large number of growers have the opportunity to study several likely varieties for their areas

without running any risk of losses of serious consequence. Decidedly greater accuracy could be obtained, however, if all the growers planted Latin Squares, for then it could be decided which was the most suitable variety for each grower.

Student Method.

In some cases a grower may be interested in trying only one variety against his regular one, and where this is desired a simple yet efficient test is available. It consists of planting alternate plots of six or eight rows of each variety until at least four plots of the first variety and three of the second one have been sown, i.e., seven plots in all. At picking time the plots are harvested as shown in Plan II. This plan is well suited for testing two varieties on a slope, for one variety is first on the up side and then on the down side of the other, and if any consistent superiority in yield is shown, it is fairly indicative that the leading variety is the better one and that soil variability has not produced the difference in yields.

PLAN II.

Plot	1	2	3	4	5	6	7
Variety	A	B	A	B	A	B	A
6 rows	123456	123456	123456	123456	123456	123456	123456
Row numbers to be picked separately for weighing	4, 5, a^1	2, 3|4, 5 b^1 | b^2	2, 3|4, 5 a^2 | a^3	2, 3|4, 5 b^3 | b^4	2, 3|4, 5 a^4 | a^5	2, 3|4, 5 b^5 | b^6	2, 3. a^6

Only the numbered rows, namely, the fourth and fifth in plot A1 and the second and third in A7, and rows 2, 3, 4, and 5 in the other plots, are weighed. The yields are then compared as shown on the bottom line of the plan, a^1 against b^1, b^2 against a^2, &c., the two rows in each case being added together to represent a plot yield.

Analysis of Results.

The value of conducting experiments along the lines of the three methods which have just been described lies not only in obtaining the average yield of a variety from several scattered plots in a field rather than from only one plot, but also in that the results can be analysed to ascertain how reliable they are. With only one plot of each variety there is no way of determining how reliable the yield is. Methods have been devised whereby the results of experiments, like the ones described, can be studied, and an estimate made as to the probability of the yields being thoroughly indicative of the merits of each variety. The significance of the results is expressed in odds such as 19 to 1. This means that if the experiment could be repeated twenty times on the same soil and under the same climatic conditions, in only one trial would a variety which was so significantly ahead be likely to be surpassed by any of the other varieties. Investigators throughout the world accept odds of 19 to 1 as being indicative of reliable ability on the part of one variety to outyield another.

It is necessary that such an analysis be made of the results obtained from experiments. In many tests of cotton varieties that have been

conducted here, yields have been obtained which would appear to indicate that a variety might be ahead by a substantial margin, yet when the data were analysed no significant differences were shown, that is, the odds were less than 19 to 1. In some cases checks on the yields from the experiment were available in the form of pickings from the portions of the rows that were not used in the experiment, and the variety which was ahead in the test but not significantly so, was surpassed in the bulk pickings by the second highest yielder in the test, thus demonstrating the validity of the conclusions drawn from the results obtained in the experiment.

More Varietal Testing Required.

It can be seen, therefore, that careful testing of the merits of each variety will be necessary before their full possibilities will be known. The tendency of many of the growers to try only one plot of each variety will have to be changed if this is to be accomplished, for while valuable information can be obtained from such a method as to the opening of the bolls, freedom from insect pests and the general suitability of a variety for a district, no accurate comparison can be made as to the relative yielding ability of the different varieties which may be thought to have possibilities. The new tariff schedule will necessitate more of the harder bodied cottons being grown. This possibility was visualised several years ago, and ample supplies of seed are available to meet requirements. The most suitable soil types and districts for these varieties have been fairly well ascertained, but it is necessary that they be extensively tested in carefully conducted experiments in order that the most profitable for each main soil type and district can be determined. The Department of Agriculture and Stock is investigating the merits of a large number of varieties, and as their requirements become understood they will be released for general testing. Unless sufficient growers co-operate in conducting reliable tests of them, the true value of each variety cannot be ascertained. A large number will eventually have to be discarded, for it is advisable to grow as few varieties as possible on account of the danger of contamination of seed at the ginneries, and to establish a general uniformity of lint produced. Without the results from a comprehensive series of carefully conducted tests, it will be extremely difficult to decide on the most valuable varieties to keep.

The growing of only one variety in a district is highly advantageous if at all possible, not only on account of the pure seed operations, but where only one variety is grown the growers will concentrate on studying their cultural methods to ascertain causes of low returns rather than blame the variety they are growing. If most of the growers in a district are obtaining good yields from a variety, there is obviously some local cause for failure on any particular farm, and experiences over several years have indicated that the explanation of such low yields can often be obtained without changing the variety. It is to be hoped, therefore, that greater interest will be shown in carrying out properly designed tests. The Cotton Section of the Department of Agriculture and Stock has prepared plans for the laying out of such experiments as have been described, and will be only too pleased to forward the same free of charge to interested growers, and to analyse

the results obtained if returned to the Department. Anyone interested in carrying out such tests should communicate with the Cotton Instructor for his district, or with the Department of Agriculture and Stock, Brisbane, giving information as to his soil type, the acreage to be sown, results that have been obtained with cotton in the past, and varieties that have previously been tried.

A CALF-PROOF GATE.

The gate illustrated is a handy type of bush gate in common use in Western Australia. It is made of round bush timber. The top rail and latch posts are made of forked posts, bolted together; the fork on the top rail makes the gate rigid, as it acts as a brace, and the fork on the latch post is at right angles, and prevents the gate from sagging and leaning over when closed; also when open it stands upright in any position, and it is easy to close. The hinge end of the gate is simple. Bore a hole in the top of the post and through the top rail, and insert an iron peg with a big washer or piece of iron plate with a hole in it. The washer makes it turn easier. Taper the post to a point, also to stop friction. The centre rails are hung loosely with wire; if a calf or sheep lean against them they push them upwards, and they cannot get through.

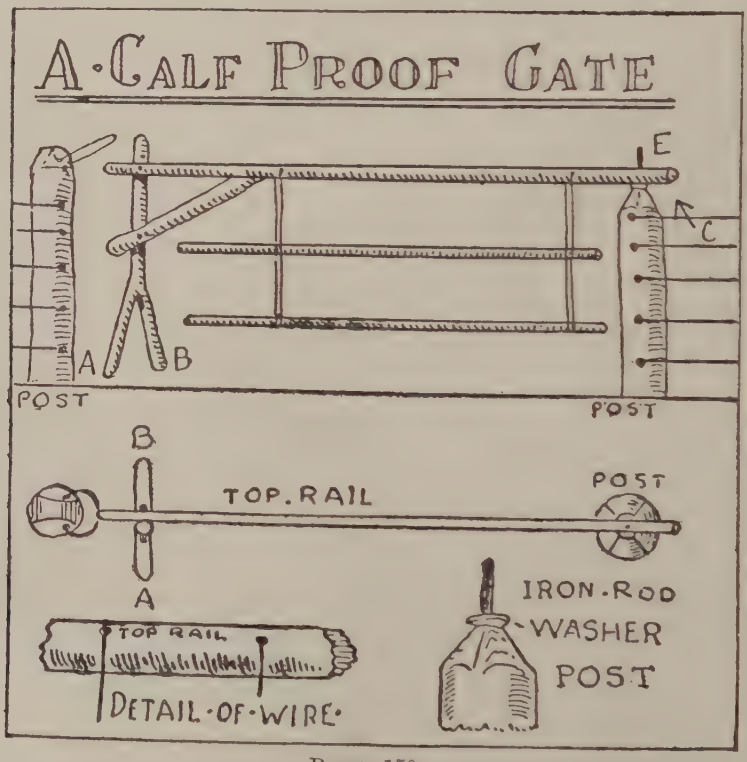

PLATE 150.

The top drawing shows the gate with posts at side and fence wires. The upright latch post of the gate has a fork A B, at right angles to the gate. E is an iron rod on top of the hinge post. C shows the position of the washer. The second sketch shows a plan of the gate. The bottom left-hand sketch shows the position for boring holes in the top rail for wires near the top of the rail. The bottom right shows the gate post tapered off, washer, and iron rod. This gate is cheaper and a lot handier than wrestling with an ordinary wire gate.

Factors Relating to the Production of the Harder-Bodied Cottons.

By W. G. WELLS, Director of Cotton Culture.

THE Tariff Schedule tabled recently has enlarged the market for the Australian spinners in several classes of yarns that can best be manufactured from the harder-bodied 1 to $1\frac{1}{16}$ inch cottons. It will be necessary, therefore, for the Queensland growers to produce more of this class of cotton in order that the spinners may operate on the most efficient basis. Fortunately, it appears entirely feasible to supply the quantities of such cottons that will be required, provided proper attention is paid to the selection of soils suitable for their profitable production. The following article has been prepared to present to growers important factors bearing on the production of these types of cotton.

Results from Early Tests of a Variety Producing a Hard-bodied Cotton.

The Department of Agriculture and Stock realised in the early stages of this present phase of cotton-growing, that varieties producing the harder-bodied medium staples would probably be required for some of the climatic conditions of the districts where cotton might be grown. Seed of the Lone Star variety, which was the outstanding American cotton of this type at the time, was accordingly imported in 1923, and fairly satisfactory results were obtained with it at first. Very unsatisfactory yields were generally produced, however, when more extended tests were made, especially in the districts with harsher climatic conditions where such a variety might have been expected to be eminently satisfactory. Tests were continued with it, however, and breeding operations were instituted to develop suitable acclimatised strains, for in a few trials it produced profitable yields of fibre of good quality.

Explanations of Early Results.

In the course of further investigations in the Lone Star and other varieties, it became apparent that many of the problems connected with growing cotton in this State were not solely a question of finding suitable varieties, but in reality the much broader subject of either selecting suitable soils, or of adopting cropping systems which would maintain the soil in a proper condition for producing profitable yields of cotton. With the opening up of the Upper Burnett-Callide Land Settlement Scheme for closer settlement, large areas of virgin country were brought under cotton cultivation. During the first few years excellent returns were obtained, especially on the alluvial soils, but with continued cultivation of cotton, the returns diminished steadily. It was noted, however, that the yields obtained on land newly brought into cultivation, though often adjacent to old cultivations, were generally satisfactory, and in the investigations of the causes it was ascertained that the nitrate content and carbon-nitrogen ratio of the soils played a very important part in the returns that were obtained from cotton.[1] When this aspect of the work had been well demonstrated, the possibilities of producing a wider range of cottons in many of the districts were greatly increased.

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(1) See "Cotton Growing on New Cultivations," by W. G. Wells, "Queensland Agricultural Journal," April, 1934.

Further Importations of the Harder-bodied Cottons.

More varieties of types producing the harder-bodied cottons, which, in the earlier stages of cotton growing here, did not appear to have possibilities for many of the districts, have accordingly been imported, and with proper selection of soil types several have yielded promising results under a wide range of seasonal conditions. The seed stocks of these were increased, and during the 1933-34 season sufficient supplies of the varieties yielding the harder-bodied 1 to $1\frac{1}{8}$ inch cottons of good strength were produced to meet all requirements. Breeding centres have been established for each of the most promising varities, and supplies of improved seed are being developed. Test plots and varietal trials have been conducted of all except the most recently introduced varieties, and a sufficient understanding of their possibilities has been obtained to allow of their allotment to growers with reasonable prospects of their producing profitable yields.

PLATE 151.—TESTING FOR STRENGTH AND DROUGHT RESISTANCE IN A BIG BOLL VARIETY.

Each season thousands of plants are examined by the Cotton Section of the Department of Agriculture and Stock, and upwards of 2,000 plants are picked individually for further inspection in the laboratory. Progeny rows of the plants selected finally as worthy of further study are planted in the following season in breeding blocks, where the uniformity of plant and fibre characters is carefully studied. The most promising progenies are kept for further increase and trial. In this manner suitable strains are being developed of the main varieties now being grown.

The position is, now, that the Department is faced with the problem of eliminating as many varieties as possible after their full possibilities have been ascertained. The co-operation of the growers on a much larger scale than has been given by them in the past, is therefore, necessary, in order that a comprehensive sampling of the various soil types in every district may be obtained with each variety. Carefully conducted varietal trials of the type described in "Varietal Testing"[2]

(2) See "Varietal Testing," by W. G. Wells, "Queensland Agricultural Journal," September, 1934.

will be required for several seasons before much elimination can be effected in some districts, while in others the problem will be simpler. As pointed out in "Varietal Testing," the trials must be of the proper type, however, for the tendency of the growers in the past to compare their results obtained from a field of only one variety, with that of a neighbour having a different one, or to compare the yields of single plots of several varieties on the one farm, is of little value as far as yielding ability is concerned, and often serious confusion of thought arises amongst the growers in a district, due to the conclusions obtained in such a manner. Undoubtedly, in many of the subdivisions of some of the districts it will be possible to reduce the number of varieties to one, or possibly two, where diverse soil types exist, and it is to the interest of all concerned that such simplification be speedily effected.

Suitable Soils for Varieties Producing the Harder-bodied Cottons.

Generally speaking, it appears that the big boll types producing the harder-bodied cottons will be better suited for the harder clays and clay loams of the following types:—The slopes originally under ironbark or box-trees; the poorer box flats, especially where they join the lower brigalow scrub slopes; the brigalow scrub slopes; and the brigalow and belah scrub mixtures. Likewise, the harder or the poorer soils of the brigalow and softvine scrub mixtures; the poorer shallow sandy loams overlying clay subsoils in both forest and scrub; and some of the heaviest clay types of the alluvials, such as the black soils of the open plains type adjoining the box country, are also well suited. All these soils, particularly if they have not been under cotton cultivation for more than four or five years appear to be capable of producing heavy yields of this type of cotton under reasonably favourable conditions. Which variety, is a matter of experimentation in some districts, while in others rather clear-cut indications have been obtained that some of these cottons are not suitable. It is confidently anticipated, however, that a satisfactory selection of suitable varieties can be accomplished if sufficient growers will assist in carrying out properly conducted tests.

It is pointed out, however, that it appears unlikely that over a series of seasons satisfactory yields will be produced with most of the big boll hard-bodied cottons, on the more fertile alluvial loams, or on the soft vine scrub soils of high nitrate content. In occasional seasons with either low rainfall, or when very heavy rainfall is experienced in the spring and early summer, and moderate amounts at mid-season, good yields may be obtained with these cottons over a wide range of soils.

Relationship of Soils to Varietal Types.

All the suitable classes of soils described above are usually of only moderate nitrate content and mostly have a stiff clay subsoil, a combination that seems to be very favourable for the production of satisfactory yields of cotton, especially of the harder-bodied types. The explanation of their suitability appears to be that with the low nitrate content and harder soils, only moderate plant growth is made, particularly in wet seasons when a partial water-logging of the soil tends to produce the effect of a physiological drought—the plants being of a small and toughened type. This does not appear to handicap the big boll varieties producing the harder cottons, but types producing medium-bodied fibre are undoubtedly sometimes affected during dry

periods. Investigations carried out at the Cotton Research Station have shown that the nitrates of the surface soils are easily leached through the first 18 inches of soil, and apparently where a clay subsoil exists around this level, sufficient nitrates and soil moisture are accumulated to enable the big boll types to carry through fairly stress periods with only moderate damage to either yield or quality of the crop.

A different result is obtained, however, on the deeper alluvial more fertile loams and clay loams, or on the deep scrub soils of high nitrate content. With the higher nitrate content of all these soils, a greater stimulation exists to produce a larger and sappier growth of plant structure of all varieties which is more subject to crop losses from various causes. Shedding in prolonged dry periods and then physiological shedding during luxuriant growth in a following wet spell; insect attacks removing a large amount of the crop and then rank growth occurring, afterwards accompanied by further insect attacks or physiological shedding, especially if wet weather of any duration is experienced, may all affect the returns obtained from these soils. The big boll harder-bodied types all tend naturally to make rather vegetative growth on such soils, and appear more susceptible to disaster than the more open types producing the medium-bodied cottons. Apparently if serious

PLATE 152.—A FIELD OF DURANGO COTTON.

A good crop of the Durango variety on a representative better class of alluvial loam of the Callide Valley.

loss of crop occurs around mid-season in the big boll drought resistant varieties, there is such a definite tendency to the formation of what might almost be termed a determinate habit of growth, that only a light recovery of crop is effected, except under the most favourable conditions.

It has been clearly demonstrated, however, in investigations carried out at the Cotton Research Station, that the varieties of more open habit of growth and producing the medium-bodied cottons, such as Durango, Indio Acala, and Starvale, are quickly able to develop a fruiting structure well loaded with flower buds after a disaster has been experienced. If reasonably favourable conditions follow, a crop is obtained which, in some seasons, is of astonishing magnitude. This

particularly applies to Durango, which has often produced profitable returns in many of the districts after a serious loss of crop has been experienced, even as late as the end of February. This factor is of outstanding value on the alluvial loams, and unless a variety with similar ability can be found in the harder-bodied cottons, it is questionable if it will be advisable to substitute any of them for Durango, even a variety producing fairly satisfactory yields under average conditions, for Durango has so often produced profitable crops after disasters have occurred. It may be possible, however, to develop suitable strains of the medium-bodied cottons such as Indio Acala or Starvale for these soils, and investigations along these lines are in hand. As both varieties have a higher lint percentage than Durango, some increase in yield of lint might be obtained in seasons when late crop disasters are experienced.

The effect of soil types on the relative yielding ability of the high and low lint percentage cottons is shown in Table I. in a comparison of the results obtained in two varietal tests of the same four varieties conducted in a district in the 1933-34 season.

TABLE I.

Soil Type—3 Year Old Cultivation—Loamy Soil Adjacent Brigalow Scrub Slope.

Variety.	A.	B.	C.	D.
Yield per acre in lb. seed cotton	1307	871	1178	1347
Yield per acre in lb. lint cotton	423	340	448	488
Lint per cent.	32·4	39·0	38·0	36·25

Soil Type—5 Year Old Cultivation—Alluvial Loam Originally Covered with Blue Gums, Moreton Bay Ash, and Iron Bark.

Variety.	A.	B.	C.	D.
Yield per acre in lb. seed cotton	1135	563	835	847
Yield per acre in lb. lint cotton	368	220	317	307
Lint per cent.	32·4	39·0	38·0	36·25

In the first experiment on the newer cultivation, and possibly slighter heavier soil, variety D significantly outyielded all others, and variety C barely significantly outyielded A. All were significantly better than B, which had the highest lint per cent. Thus, two of the three high lint percentage varieties were better than A—which had the lowest.

In the second experiment on the older cultivation of alluvial loam, the low lint percentage variety A, which was of the most open type of growth, significantly outyielded all. There was no significant difference between C and D, while B was outstandingly low again, although it was of the highest lint percentage. In both experiments B experienced the most losses from boll rots. The results of the two experiments are in keeping with the usual behaviour of these varieties, and indicate

clearly the necessity of selecting suitable soil types for the different varieties.

Necessity for Ample Supplies of Hard-bodied Cottons.

It must be remembered, however, that the New Tariff Schedule has extended the markets for the Australian spinners in the yarns requiring the harder-bodied cottons. It is necessary, therefore, that ample supplies be grown of such cottons, and where there appears any possibility that they can be grown profitably, the Department is allotting seed of the most suitable varieties producing these types of lint. Fortunately, large areas of the harder-soil types occur in many of the main cotton-growing districts, so that it will be possible to grow ample supplies of such cotton. As these soil types are less suitable for the medium-bodied cottons in very dry seasons, a higher general quality for the whole of the Queensland crop should be obtained over a series of seasons. Growers with suitable soils such as have been described in this article should, therefore, apply for seed of the harder-bodied cottons.

Lint Percentages.

The introduction of varieties producing the harder-bodied cottons has brought into prominence the question of the advantages of producing varieties with a high lint percentage, and undoubtedly many growers will be inclined to grow them under the impression that the higher lint percentage a variety has the greater will be the yield of lint per acre. This appears plausible, but has been disproved in Queensland and in many other parts of the world. The suitability of the high lint percentage varieties producing the harder-bodied cottons depends largely on the soil type and the seasonal conditions. Where suitable soils such as have been described are available, undoubtedly under average conditions, yields as heavy or even appreciably heavier than those produced by the lower lint percentage cottons will be obtained with some of them, and often the quality of the lint will be superior, especially in dry seasons. It does not follow, however, even on suitable soils for the cottons producing the harder-bodied fibre, that the variety with the highest lint percentage will produce the most lint. A variety which does well in a district usually experiencing fairly good rainfall may not be at all suitable for a drier district, although it is planted on suitable soil types in both instances. Conversely, one of the big boll drought-resistant cottons with a very high lint percentage may yield excellently in a dry district, but will give very poor returns of low-grade lint in a wet district, even if planted on a soil suitable for the big boll types. The following data, which was obtained in an experiment conducted in the 1933-34 season on a bloodwood-ironbark slope well suited for the production of the big boll types of cotton, illustrates the point clearly, and shows the necessity for growers to conduct carefully planned experiments to ascertain the most suitable variety for their conditions, rather than to order a variety because it has a high lint percentage.

Variety.	A.	B.	C.	D.
Yield per acre in lb. of seed cotton	1059	656	817	867
Yield per acre in lb. of lint cotton	363	256	310	317
Lint percentage	34·3	39·0	38·0	36·5

Variety A, which was of the lowest lint percentage and was of the quality desired by the Australian spinners for a large amount of their yarns, significantly outyielded all other varieties, while B, which had the highest lint percentage, was significantly lower yielding than any.

Lint Percentages do not Necessarily Determine the Value of a Variety.

It can thus be seen that a high lint percentage does not necessarily indicate a high yield of lint. Soil and climatic conditions, susceptibility to insect attacks, plant structure, and quality of fibre produced, play an important part in the results obtained from a variety of cotton. This is recognised in all cotton growing countries. In some parts of the United States of America the varieties with the highest lint percentages produce outstandingly the heaviest yields; in other parts, generally in the same State, soil or climatic conditions make the production of substantially lower lint percentage varieties decidedly more profitable.

It is necessary, therefore, that a wide range of cottons differing in lint percentages, types of fibre, habits of growth, &c., be tried, and the Department of Agriculture and Stock has a large number of varieties under trial which have been obtained from different countries. In the first tests some of these have produced excellent yields, but the drag of the fibres was so lacking that decided improvement was obviously required before the variety could be grown commercially. Drag is the name used to describe the clinging power of the fibres, and unless a cotton has a good drag it handicaps the spinner in producing a strong yarn. Other varieties have yielded very well, yet the general quality of the fibre was lacking in many respects. A considerable number of varieties have been discarded for various causes, after careful testing for several seasons, which is the period required before the true merits of a cotton are known.

It is suggested, therefore, that before ordering planting seed a grower should get in touch with the Cotton Officer of his district, or write direct to the Cotton Section, Department of Agriculture and Stock, Brisbane. A description of the soil type on which cotton is to be grown should be included, along with such details as the acreage; trees originally on the soil, whether slope or alluvial, if old or new cultivation, results that have been previously obtained with cotton, and the varieties tested. The most promising variety will be allotted, based on results that have been obtained in tests carried out under similar conditions. It must be realised, however, that any variety of any agricultural crop may fail under unfavourable conditions. Unforeseen circumstances may cause poor returns or failures to be obtained from the selected variety. If it is a big-bolled hard-bodied type of cotton, it does not follow that these cottons are not suitable for the particular soil, for it has been shown how varieties yield varying returns according to soil and climatic conditions. If unsatisfactory results are produced, a test should be applied for in the following season to ascertain the most suitable variety, as varieties are now available for the majority of our cotton soils.

Conclusions.

1.—A greater production of the harder-bodied medium staples is now required in Queensland.

2.—A sufficient acreage of suitable soils is available in the regular cotton districts to produce ample supplies of these cottons.

3.—The harder types of soils are the most suited for the profitable growth of the varieties producing cotton of such character.

4.—These varieties are not generally suitable for the more fertile loams of high nitrate content, especially the alluvials of the districts of heavier rainfall.

5.—The medium-bodied cottons have yielded the best returns so far on such soils.

6.—The varieties with the highest lint percentages do not necessarily produce the highest yield of lint on all soil types.

7.—The harder-bodied cottons should be grown wherever the soil types are suitable, but it is suggested that the Cotton Section of the Department of Agriculture and Stock, Brisbane, or the District Cotton Instructor, should be communicated with regarding the most promising variety.

ANOTHER USE FOR A RAZOR BLADE.

Leather belt lacing frequently requires trimming, and when this is the case and a belt breaks, one often has quite a problem to effect repairs without losing too much time. An excellent tool for cutting belt lacing or even trimming the ends of belts when shortening is necessary can be made from a discarded safety razor blade, which

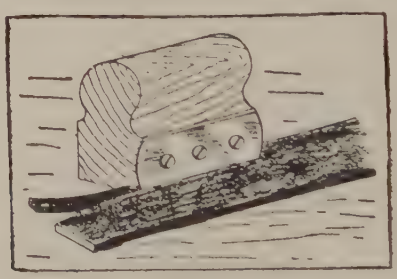


PLATE 153.

is mounted on a block of wood. The block should be curved to fit the fingers and one side at the bottom grooved or relieved to the width and thickness of the lacing required. The blade is then fastened to the block with small wood screws and the relieved portion of the block will then serve as a guide so that the edge of the blade is always parallel and the lacing will be of equal width along its length.

Common Mistakes in Bright Tobacco Production.

By N. A. R. POLLOCK, H.D.A., Senior Instructor in Agriculture.

IT is probable that in looking back on their efforts in the production of bright tobacco in the past and previous seasons there are few growers who do not recognise that there was much room for improvement in yield as well as quality in the crops they produced.

In "Tobacco Growing in Queensland" an endeavour was made to define a correct procedure in the production of a crop through various phases, from soil selection to the marketing of the leaf, as well as in pest control and precautions to be taken in the prevention of disease.

While slight departures from the lines laid down may not in certain directions be detrimental, carelessness in others has been the forerunner of more or less diminished yields with reduction in quality.

Just as a faulty foundation imperils the structure built thereon, so a wrong procedure at the outset in crop production is liable to foreshadow misfortune later on.

Seed-beds.

In a tobacco crop particularly, the provision of strong, healthy plants to set out in the field from the seed-beds is of maximum importance.

The soil of the seed-beds should be fine, friable, and fertile, and contain a good supply of humus and decaying organic matter; an advantage is usually gained when a top-dressing of superphosphate or a complete tobacco fertilizer at the rate of one to one and a-half ounces to the square yard is given prior to sowing the seed.

Seeding should not be too heavy, a small teaspoonful or one-twelfth of an ounce being sufficient for 100 square feet. Water should be applied judiciously to allow the plants to make a strong, uninterrupted growth up to the time of transplanting. Where plants are crowded they should be thinned or pricked out into another bed.

Faults with many seed-beds were noted as infertility, insufficiency of organic matter, and poor texture. In the latter, coarseness of the particles, as in very sandy soils, disallowed sufficient retention of moisture and the necessary close contact with the tiny rootlets when the seeds had germinated. In clayey soils overwatering caused stunted growth and root troubles.

Failure to burn the beds also allowed nematode infestation and probably some of the trouble from fungi.

Growers are advised to pay particular attention to their seed-beds. A good plan is to dig in fresh supplies of farm yard manure or well-rotted vegetable matter each year as soon as the fields have been planted up, and to grow table vegetables thereon until the approach of the next season when the beds should be dug up and fired in preparation for seeding. Firing of the seed-beds each year should not be neglected.

Disease.

Disease cannot be regarded as a natural concomitant of either plants or animals. Each is provided with a natural resistance proportionate

to its vigour, but when vitality is lowered through inbreeding, injudicious mating, improper selection of seed, inanition or ill-treatment, such is more readily overcome and trouble engendered. The tobacco plant is probably more subject to attack from fungous diseases with consequent loss than any other cultivated. This fact is insufficiently appreciated by the average grower whose carelessness is responsible in most instances for losses in seed-bed and field. Blue mould is by far the most damaging trouble experienced. As far as is known its attack is confined to species of the genus nicotiana, plants of other species, even when somewhat closely related, appearing to be immune. While with many crops the major diseases are more or less controlled by the growth of known resistant varieties, no success in the evolution of a variety of tobacco resistant to blue mould has yet been obtained. In its incidence, it is analagous to Late or Irish blight which occasionally causes much loss in crops of potatoes and tomatoes, since it appears epidemic in certain seasons when climatic factors probably operate to favour its development.

The fact that in seed-bed and field a mild attack is sometimes confined to a few plants here and there suggests a lack of vitality therein may be responsible.

Particular attention should be paid to seed-bed sanitation in order to promote strong growth of plant. Early growth is invariably more susceptible to disease than later, and it is in this stage that troubles are most often contracted.

In addition to care in the preparation of the seed-bed further precautions against disease should be taken in the application of fungicides, particulars of which are set out in the admirable contribution on diseases to "Tobacco Growing in Queensland" by Mr. L. F. Mandelson, and also in his Additional Recommendations for the Control of Blue Mould, Advisory Leaflet No. 7, published by the Department of Agriculture.

Sprayings to be effective should not be applied perfunctorily but regularly, as advised therein and according to directions. The objective, it should be understood, is to prevent the entry of disease by the destruction of spores which may come in contact with the film of fungicide covering the young plant, hence the necessity to maintain this film by regular and frequent applications in such a manner as to keep covered both under and upper surfaces of the leaves as well as the stems.

Once contracted, disease in the plant is not regarded as possible of cure, certainly not within a time that would allow of adequate return during the season of growth. The cost of material and labour involved in the control of disease and insect pests is not high and will be repaid many times from the added value of the crop returned.

In field practice much of the trouble experienced from leaf spots would have been avoided, or at least lessened, by heavier priming. This allows access of light and a freer circulation of air at the base of the plant, both of which are regarded as repellant. The removal of these leaves, usually of poor texture, cannot be regarded as a loss, but rather as a gain, for the nourishment otherwise used in their development will be devoted to the production of others higher on the plant, which will be of better body and not damaged by contact with the soil.

Insect Pests.

Much of the trouble caused by insect pests has been due to unsound cultural practice in which failure to eradicate and destroy plants

immediately harvest of leaf therefrom has been completed or abandoned as well as volunteer plants was common.

Careful perusal of the subject matter of "Tobacco Pests," by Mr. J. Harold Smith in "Tobacco Growing in Queensland," should convince growers that sound cultural practice will very seriously diminish such insect population.

Two of the worst tobacco pests are the stem grub or borer and the leaf miner which are closely related. As their depredations occur within the leaf or stem, control is not possible by sprays or poison baits. Destruction of the grub by burning the leaf or affected part of the stem immediately attack therein is noted is strongly advocated. Mr. Smith advises the adult moth is capable of laying as many as 150 eggs. The destruction thus of one grub or its pupa suggests protection from the ravage, potentially, of 150 individuals two or three weeks later. His remarks on the practice of many insects to pupate in the soil are worthy of note, as they stress the value of cultivation during growth and between seasons.

Fertilizers.

The use of fertilizer on the tobacco crop is not as general as is considered desirable. Even the most fertile soils produce a better leaf quality under judicious applications, since ripening is thereby accelerated and a better colour secured under cure.

Trials repeated in different districts and on various types of soil over a series of years will be necessary before a definite recommendation of a particular mixture for each can be made. So far, however, results from the use of the 4—12—6 mixture suggested in "Tobacco Growing in Queensland" are most encouraging, so much so that it is confidently predicted the conclusive result of years of experiment will be a recommendation of this mixture or of one very close thereto. Used at the rate of 2 lb. to the chain of hill or row, it has, in competition with other mixtures, given the best results, not only on the poorest soils but on the most fertile on which tobacco has been recently grown.

Where plants are set out in rows 4 feet apart the collective length of rows in an acre would be approximately 160 chains. At 4 feet 1½ inches it would be exact. Applied at 2 lb. per chain 320 lb. would be necessary for the acre or 1 ton sufficient for 7 acres. The 4—12—6 mixture, according to the Departmental formula, is quoted at £11 per ton f.o.b. Brisbane. Allowing as much as £3 per ton for carriage to the farm, an application of 320 lb. would signify an expenditure of £2 per acre.

Green Manures.

Leaf quality is definitely influenced by the quantity of humus and decaying organic matter in the soil, a fact that is insufficiently appreciated by growers. Many will have noted the absence of the lustre or shining brightness in cured leaf of later crops that was so apparent when virgin soil was first used for the purpose. Experience of tobacco leaf auction sales suggests that lustre in the leaf offered means an advantage of at least 3d. per lb. This increase in return, without consideration of the higher yield, would more than compensate for the cost involved in growing a crop and turning it under for green manure. A sufficiency of humus in the soil is absolutely necessary for profitable production, and its maintenance should be the objective of every grower.

Where it is practicable to to grow other money crops, such as maize or potatoes, that benefit from the turning under of a legume, cowpeas or velvet beans in summer, or field peas or vetches in winter, can be commended as green manures provided a crop of another kind precedes tobacco. Where tobacco is to follow a green manure, Sudan grass, sorghum, maize, or millet in summer, or ryecorn, barley, wheat, or oats in winter, offer choice.

Irrigation.

Over-irrigation, improper application of water and under-cultivation conjointly, were the cause of poor returns in many instances. Excess of soil moisture induces root rots through which leaf is apt to yellow prematurely and quality suffer, while in extreme cases, especially in early growth, the plant may be killed. Personal notes in the June, 1934, issue of the "Queensland Agricultural Journal" are worthy of perusal.

The practice of setting out plants in or on the side of the furrow carrying the water in irrigation is undesirable. Though the strike is generally satisfactory through root contact with wet soil, subsequent growth is impeded by the brick-like structure of the soil consequent on the evaporation of moisture therefrom. Further applications of water certainly soften the soil for a little while but add another defect in promoting root or stem rot.

Growth on hills with fewer applications of water and more cultivation to aerate the soil and retard evaporation is calculated to improve yield and leaf quality.

Spacing.

The setting out of plants at intervals of 2 feet in rows 4 feet apart appears to be most satisfactory and is generally recommended. Closer spacing in and between rows tends to exclude sunlight and prevent the free circulation of air. Leaf, as a consequence of growth in the shade, lacks body and does not sell so well. With lesser intervals between rows, also, cultivation cannot be so easily effected.

Cultivation.

Lack of cultivation was not generally common, but is capable of improvement, especially close to the plants. Weed growth should not only be kept down but a loose surface maintained in the soil up to the time of topping, when further attention is neither necessary nor desirable.

Priming.

As noted previously, improvement can be effected by a heavier priming than is usual. Not only will leaf quality be improved without diminution of yield, but damage from fungi causing leaf spots will be lessened.

Topping.

Experience has convinced most growers that it is better to delay topping until a few flowers have opened and then to top high rather than low. In a good growing season high topping is imperative as otherwise the leaf is apt to become coarse and cure a darker colour than is desirable. With high topping the two or three top leaves, usually narrow, are not worth harvesting. The amount of nourishment for their production is compensated by the better texture of lower leaves and the lesser growth of suckers.

Suckering.

Neglect of suckering was to be seen in many instances where they had produced flowers. Loss was consequently sustained in leaf body and damage to the web when picking. Too frequently the grower had planted an acreage beyond the capacity of the labour available. Suckers should be removed when they are about an inch long, as they are then easily broken off by pressure of thumb or finger. Working with both hands systematically, with an appreciation of the manner in which the leaves spiral the stem, the operator soon becomes expert. When suckers are allowed to grow more than 2 inches they are not so easily broken, frequently the leaf adjoining is broken off, and, at times, the sucker has to be cut with a knife. The longer time occupied, then, adds to the cost of production while leaf quality is adversely affected.

Harvest.

Perhaps in the selection of leaf that has reached a desirable degree of ripeness the most common fault of growers is to be found. Too frequently under-ripe leaf is included in the barn, and the cured colour of the whole more or less spoilt while waiting for it to yellow.

Inability to recognise the change of colour to ripeness is sometimes due to colour blindness, a failing especially in gradations or shades of colour that is not very uncommon.

Growers should recognise that the lowest leaf on the plant, which is also the oldest, will invariably be riper than the one immediately above. At times a leaf further up the plant, above known unripe leaves, will show a tinge of yellow or be pronouncedly so in one part. This does not signify ripeness, but is the result of an impediment in the fulfilment of its function due to broken veins or midrib, a grub in the latter or in the stem near the junction of the leaf; it may be also due to disease. Such a leaf should not be included in the cure. Under-ripe leaf, no matter how well treated, possesses a characteristic aroma which cannot be disguised. Its presence is easily detected by a buyer and a lower price is offered or purchase declined.

When picking, if doubt is felt regarding ripeness, the leaf should be left. Following this course few leaves will be found over-ripe at the next picking, but their loss will be more than counter-balanced by the better price received than if under-ripe leaf was included.

Experience is the only sure guide to a recognition of ripeness. By marking doubtful leaves and observing their behaviour from day to day a perception of ripeness is most easily attained.

Ripeness in coarse or heavy leaf, due to low topping or growth too late in the season, is indicated in a brittleness of the leaf, of which the tip curls downward and the edges frequently inward. Folding part of the leaf under and flattening with slight pressure, ripe leaf will show a clear break. Folded upward unripe leaf will crack across but the break will not extend to the surface cuticle.

Leaf of this character is best cured by itself, but if there is insufficient to warrant the use of a barn for the purpose, it is best strung separately and placed out of sight on the top tiers of the barn.

Care in handling leaf at all times is most desirable, since broken stems are conducive to lower prices.

Curing.

Faults in curing are many and varied; heats are most frequently raised too slowly and at times too quickly and over-ventilation is often a cause of poor colour and sponging.

In raising the heat it should be recognised that the atmosphere is heated more quickly than the leaf, hence the necessity in the earlier stages for the rise to be not more than 2½ degrees in the hour, with usually a pause after every 5 degrees rise.

Following the instructions for the cure of light, medium, and heavy leaf in "Tobacco Growing in Queensland" most growers have obtained satisfactory cures. Few, however, have kept records of each cure or made notes on the behaviour of leaf during the process. No hard and fast rules can be laid down, but if access of colour, hardened tip, shrivelled end, curled edges, dried web, and later veins are recognised as guides for rise of temperature and alteration of ventilation, good results must follow.

Notings of behaviour in one cure can be expected to influence betterment in others following. Faults in ventilation were chiefly in an excess both top and bottom.

An extreme instance of this was noted where a 16 by 16 feet barn was provided with eight rabbit-hutch type of bottom vents, two on each side, each 30 by 12 inches, making the total area of opening 20 square feet. The top vent along the full length of the ridge was 16 by 2 feet representing 32 square feet. The grower, who experienced much sponging during a lengthy period of cure, expressed the opinion that a better result would be obtained if the whole of the roof could be removed. Needless to state the consumption of firewood per cure was also excessive.

In the instructions for curing, the amount of ventilation is suggested as an inch or so, a quarter, a half, and full, but when the area of the vents is not in accordance with that approved under Flue-curing Barns in "Tobacco Growing in Queensland" the terms are apt to mislead.

The actual amount of ventilation required is hard to determine as it varies with the fullness of the barn and the body of the leaf therein.

It has been calculated, however, that a superficial top vent opening equal to 2½ per cent. or one-fortieth of the floor area of the barn with a provision at the base equal to half that on top is usually adequate.

This would mean that in a 12 by 12 by 16 feet barn the top vents when fully open would represent a superficial area of 3·6 feet or 518·4 inches—say, 4 square feet. Those at the bottom would be 1·9 feet or 259·2 square inches—say, 2 square feet, which is half that on top.

In a 16 by 16 by 16 feet barn the floor area would be 256 square feet, one-fortieth of which would mean 6·4 square feet—say 6½ square feet—as full ventilation on top and 3·2 square feet—say 3¼ square feet—as full ventilation below.

In erecting barns it is usual to install a sufficiency of top ventilation on each of the two sides of a gabled roof or on each of the four of a hipped roof so that the vent or vents on one side only, opposite to the direction of the prevailing wind, would be used when curing.

Bottom ventilators are usually placed two at the back and two at the front of the barn to allow of additions being made thereto and similarly used. Two or the whole four may be used, but the amount of opening given should not collectively exceed that suggested.

Where the air on entering the barn comes in immediate and close contact with the hot flues a great advantage is gained.

Excessive ventilation is mainly responsible for sponged leaf. When the top vents are too large the temperature at the higher tiers is much reduced. With too much bottom ventilation the ascending air is not evenly heated.

Where top vents are open in the direction of the prevailing wind, a fault of not infrequent occurrence, the outward flow of used air from the barn must be hindered and cold air enter. The result is a delay in the cure with deterioration of colour.

The heating system also in many barns is capable of much improvement.

Bulking.

Occasional instances of the inclusion of fat stems and of leaf being bulked with too much moisture have been noted, followed by neglect to examine condition periodically, especially after a fall of rain. As a result darkening of colour and even moulding have occurred.

A good plan is immediately on removal from the barn to bulk the leaf down on the sticks and to cover the bulk for a day or longer before taking it therefrom. This will necessitate a double set of sticks for each barn and somewhat more space in the bulkshed. Advantage will be found in a greater evenness of condition and the opportunity to roughly grade the leaf into Bright, Medium, Dark, and Green, with more certain exclusion of fatty stems. This expedites and reduces the cost of subsequent grading for sale.

Grading.

The grading of leaf on the farm is commended as the grower thereby gains a better idea of quality and is impressed with the directions in which improvement is most desirable.

As a general rule, home grading has been approved by buyers. There is perhaps a tendency to make too many grades, a fact which is reflected in a number frequently realising the same price when sold. This, however, is to be commended rather than condemned as it will be righted as experience is gained.

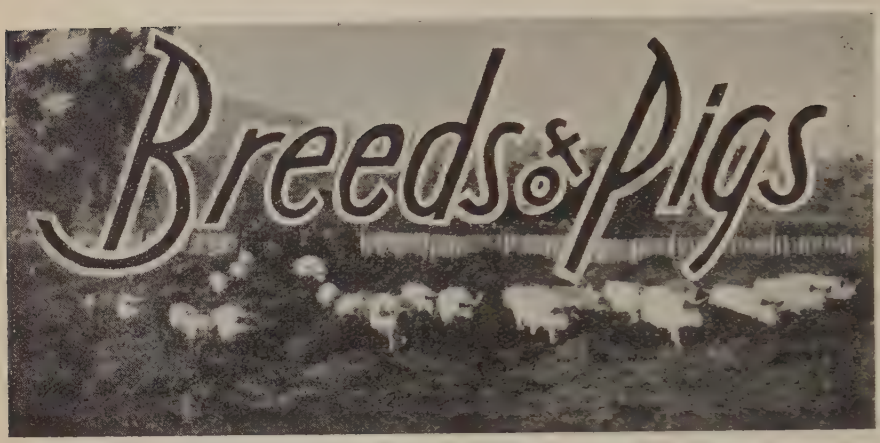
In grading, colour only is most often the only guide followed. Body and damage should also be considered. Papery leaf is of less value than that of medium body, likewise boardy leaf is inferior to that with good elasticity. Even though colour may be uniform, diversity in other directions can be expected to adversely influence price.

Where a uniform growth is made each picking is of leaves occupying practically the same position on the respective plants and is mainly uniform. When each cure is roughly graded before bulking, those from the different pickings can be kept separate. This practice will not only facilitate grading for colour but also for size and quality in other directions. Broken stems are anathema to the buyer as cost of handling at the factory is thereby increased. They should be graded out and baled as scrap, for inclusion with whole leaf lessens the offer.

Handing.

Hands frequently carry too many leaves and are unduly large, while ties as a rule are far from neat.

The grower is known by his product so, when grading is done on the farm his care or otherwise, therein, becomes known to the buyer whose offers of purchase are correspondingly influenced.



E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

PART II.

THE MIDDLE WHITE.

PURE white in colour, of a conformation similar to that of the Berkshire, and having unique qualifications as a breed specially adapted for the production of pigs suited to the pork trade, the Middle White—still referred to frequently as the Middle Yorkshire, the Mid-White, and the Medium York—is without doubt one of the breeds in which pig raisers in this country should be especially interested.

British in origin, its home in the heart of Yorkshire, England, it has an historical record like that of the Large White, full of interest especially to those who like to delve into records and try to get back to the beginning of things. Possibly it is difficult to indicate with any degree of certainty just where and when this well-known breed had its actual beginning. Doubtless it originated among those of our forefathers who, as stockmen, instead of depending upon a more weighty, growthy, and mature pig preferred to make a selection from available stocks of a type more blocky in stature and conforming particularly to the peculiar requirements of the pork butcher than whom there was no more particular connoisseur associated with the meat world.

Originally there was but one Yorkshire breed, a popular and profitable animal, the product of selection from types developed following the introduction into Great Britain of the Chinese type, and its use in grading up from the original wild hogs of Yorkshire and Lancashire.

Early History of the Middle White.

In 1860 prominence was first given to the qualifications of this type of Yorkshire pig, and about the same time they were first brought before the public at stock fairs and village shows. Three distinct offshoots from the original parentage had thus been developed, the Large White, whose history was traced in the August issue of this Journal; the Middle White, with which we are at present concerned; and the Small White, to which reference is made later in these notes.

It is of interest to note that the Middle White has, all along, maintained its place in the pig world, because of its docility, prolificacy, prepotency, quick and easy growth, and adaptability—breed characteristics no less valuable in these days of keen competition than they were in those far-off days when farmers knew but little about breeds of pigs.

Notable among early breeders of this type were the Wainmans, whose boar, "Lord of the Wassails," was the first male of the breed to win a prize at the Royal; they were prominent fanciers of this type for many years after that. Then followed the Harrisons of Stockport, the Duckerings, Collinsons, Mangles, Peter Eden (who owned a sow, "Gem," which produced seventy-four pigs in six litters), the Stricklands, the Earl of Ellesmere, Sir Gilbert Greenall, Ashford of Rufford, the Twentymans, and in later years among a host of others, the venerable Sanders Spencer of Holywell, whose name will for ever remain associated with progressive stock raising in the nineteenth century.

Plate 154.—Middle White Sow.

This prize-winning Middle White sow protrays type, conformation, and quality, such as is sought for in this popular breed.

Mr. J. T. Eady reminds us in his interesting review of the breed in the 1934-35 Pig Breeders' Annual that so successful was Sanders Spencer that his herd won in five years 339 prizes amounting in cash to £1,400, and after an interval in the second five years, 401 prizes totalling £1,600, a reminder that there was plenty of money in pigs even as far back as the 'sixties. The success attending his efforts naturally spurred other breeders on, and in rapid succession came the development of such well known families as the Holywells, Histons, Pendleys, and Wharfedales, of whom representatives have on several occasions been imported to Australia. Mr. Eady also reminds us that

although Sanders Spencer has gone, the Middle White breed will remain a testimony to his life work, that will last for all time, and keep his memory evergreen. The Walton herd of the late Sir Gilbert Greenall played its part, and had a great influence on the breed, and was prominent for many years. Such names as "Walton Rose," "Walton Daisy," and "Walton Turk" occur and reoccur many times in the history of many Middle White families of to-day, so also does the Wharfedale Reveller family, Wharfedale Deliverance, and Pendley Choice. Prominent also was the late Leopold Paget, whose death only quite recently was a sad blow to this breed. Representatives of the Histon herd of Chivers & Son have had an important part in the breed's more recent history; in fact, one sow in particular, "Histon Lady Choice," sold for the English record price of 180 guineas some twenty years ago or so.

PLATE 155.

Champions at the Royal Show, Sydney, 1934, this pair of Middle Whites illustrates the type available here. The boar carries a heavy coat, and is somewhat coarse and curly in hair. The sow is more refined, and has a particularly well-developed set of udders.

Another breeder whose name is well worthy of a place in this list is Arthur Hiscock, whose family did a great deal to popularise the Middle White breed.

Prominent among the breeders who were interested in this breed in Australia in the early days of registration here are included: Mr. J. J. Baker; Dookie Agricultural College (Victoria); Hawkesbury Agricultural College and Gladesville Hospital (N.S.W.); Messrs. E. Jenkins, F. E. Kurrle, Chas. Jones, Peter Miller, Jno. Madden, S. A. Peck; Queensland Agricultural College, Gatton (Q.); Messrs. W. J. Warburton, and W. R. Robinson.

In those days the Large White had fewer followers than now, but it can be said in all fairness that the Middle White led the way in the earlier years of pig improvement in this country.

Special Qualifications of the Breed.

Fostered by the National Pig Breeders' Association in England, and the Australian Stud Pig Breeders' Society in Australia, the Middle White has gained for itself a place of importance in the pig industry.

The Middle White ranks with the best of other breeds, indeed it probably excels the others as a breed suited to the production of

porkers, for there is no quicker feeder than the Mid White for production at an early age of the light weight prime quality carcasses nowadays so much in demand locally and overseas. It is in addition an excellent butcher's pig, dressing out to advantage with a minimum of offal and an attractive, neat, lengthy carcass. With other breeds it has improved appreciably in its suitability for the production of baconers, the typical carcass having good length, depth, and a reasonable proportion of lean meat.

For porkers it approaches the ideal in the pure bred form. It is useful also for crossing with the Berkshire, while crosses with breeds like the Tamworth increases the proportion of lean meat and produces a light coloured animal much in demand; although in such a cross as the latter, care must be taken that the young pigs do not become too leggy and lean before being finished for market.

PLATE 156.

Though somewhat more compact and of blocky stature, this Middle White sow shows plenty of quality and is well developed and roomy in body, and has proved a profitable addition to her owner's herd.

The breed ranks high in prolificacy, 1,638 litters recorded in 1932 (in England) giving an average born per little of 9·55, with an average reared of 7·57, as against the Wessex Saddleback, which topped the list with a reared average of 8·12. The writer's experience is that, if given a reasonable chance and kept in medium breeding condition, the Middle White will easily eclipse the English figures under Australian conditions. A special characteristic of the Middle White is its docility, the sows in particular being exceptionally docile and careful with their young. They are liberal milkers, and the young pigs grow rapidly and are of attractive type at an early age, points of especial importance in preparation of stock for market. Being docile naturally indicates that the breed has an even temperament, and settles down quietly to its environment.

PLATE 157.

"Norfolk Poppy 3rd," 4609, Champion Middle White sow, Brisbane Exhibition, 1934. Shown by Mr. J. J. Slack. This sow is a daughter of the imported "Anport Fuchsia, 9th," 4192, a sow of excellent type and conformation with noted prize-winners in parentage. Note feminine characteristics and capacity to suckle and rear large thrifty litters.

Good constitution, a well developed heart girth, withal a light shouldered type, there is no reason why Middle Whites should not be suited to conditions on any farm. The fact that the breed is kept extensively under open air conditions in colder countries has proved its capacity as a grazing animal. Even in warmer climes it can stand up to extremes in temperature without undue distress—another evidence of its suitability for Australian conditions where open air systems of pig-raising are becoming more popular each year.

Breeders in Queensland who have tried the Middle White under these conditions report success. The late Mr. W. J. Warburton, of Northgate, had this breed for many years prior to the general adoption of a paddock system; so did the late Mr. W. R. Robinson, who claimed to have been the first to introduce this breed into this State.

In England many of the leading breeders keep their pigs out-of-doors throughout the year, even during winter months, with snow on the ground. In more recent years breeders like Messrs. Pope and Sons, of Nambour, Dinmore Stud Piggery, G. W. Winch, of Zillmere, and others have kept their Whites under a semi-intensive system, permitting the animals to remain in the open air as long as they wish, providing suitable shelter sheds or shade trees as required. Breeders in North Queensland, Messrs, J. E. Foxwell, W. J. Sloan, and others report similar success.

Early maturity is another special qualification of this breed; in fact, the National Pig Breeders' Association emphasise the breed's claim to distinction by its success in pork carcass competitions at Smithfield and Birmingham Fat Stock Shows. They state that the Middle White, in common with other breeds enjoying similar status, has proved itself to be an excellent pig for the farmer who prefers to crossbreed, and whose objective is early maturing pigs for the pork market.

The breed possesses prepotency by virtue of long continued registration and its suitability proved by many years of experience for mating with strains lacking in this respect. The breed can be used to advantage for crossing with pigs lacking the same qualifications, and where early maturity, trueness to type, and even conformation are desired; especially is this so in regard to the use of this breed in the production of uniform quality porkers for the frozen pork trade. The advantage the breed possesses in stamping its white colour on its progeny should not be overlooked in considering the selection of stock for use in this branch of the industry.

Refinement of quality is a goal towards which all pig raisers should aim, and in this direction much can be done by the use of a breed noted for its refinement and trueness to type.

Queensland experience indicates that the White breeds have come to stay, and that they can be used to advantage in the building-up of an expansive export trade.

The general recommendation of officers in the Pig Section of the Department of Agriculture and Stock is to use the Middle White boar where good type Berkshire, grade or first cross sows of similar type are available, and/or to use Middle White sows as matrons in the herd, and to use either a Middle White or a Berkshire boar. Some emphasis has been given to the value of the Middle White-Tamworth cross, and

the cross where sows carrying British Black blood are available. It is noteworthy that at the first of the series of annual carcass contests conducted by the Queensland Meat Industry Board, Middle White pigs or their crosses secured the premier awards.

If one point might be stressed more than another in dealing with the Middle White breed, it would be to urge the necessity for special attention in the selection of breeding stock to obtain lengthy deep-bodied pigs with a heavy coat of silky hair and with a pinkish skin free from blue or black spots or freckles as far as this is possible. Any strain showing a tendency to shortness and chubbiness of body and to overfatness should be discarded. Select only from large, thrifty litters, and be certain that both boar and sow, the latter particularly, have twelve, fourteen, or sixteen well-developed permanent teats evenly distributed along the belly line. Any indication of coarseness in bone, rupture, or other abnormalities in breeding organs or lack of sufficient hair to protect the skin should be guarded against. Selection of the proper type and their care and attention along approved lines will overcome any tendency this or the Large White breed may have to suffer as a result of the warm climate.

STANDARD OF EXCELLENCE

For the Middle White breed as adopted by the Australian Stud Pig Breeders' Society, 1934.

	Points.
Head and Ears—Short and light, wide between eyes and ears; face slightly dished; ears medium, carried erect or slightly forward, and fringed with fine hair	15
Neck and Shoulders—Medium length, evenly set on shoulders; jowl full, but not heavy; shoulders well sloped backward, and free from coarseness	10
Back and Sides—Long and straight; loin full; ribs well sprung, sides deep and full to flank, showing straight underline; and in sows, twelve good, evenly-placed teats	20
Hams—Broad, full, and meaty to hocks; tail set high, not coarse	20
Legs and Feet—Short, straight, and strong; feet firm and strong; hoofs nearly erect; action free and clean	15
Colour, Skin, and Hair—White, free from black spots; skin fine and free from wrinkles; hair long, plentiful, and fine and silky	10
Character—A combination of all the points showing distinctive breeding, type, and quality	10
	100

THE SMALL YORKSHIRE.

Many years ago the Small Yorkshire was prominently before breeders in the Homeland and in this country, but at the end of the nineteenth century this and several other breeds of similar type had lost ground and the Small York and the Small Black (often referred to in Australia in these days as the Black Essex) in particular have disappeared altogether, and nowadays are not bred to any extent in any part of the world.

The reason for their decline was their unsuitability for the warmer climatic conditions of Australia. Any advantage they possessed and the breed qualifications have been improved upon and commercialised in the Large and Middle White breeds, which in themselves have been bred more along commercial lines in recent years.

At the Brisbane Show.

NOTES ON THE PIG SECTION.

By E. J. SHELTON, H.D.A.

THAT the periodical introduction from countries overseas of fresh strains in the different breeds of pigs is productive of good needs no greater emphasis than mention of the success of imported stock at the recent Royal National Association's Exhibition at Brisbane, Queensland, at which there was a very comprehensive and valuable display of stud and commercial pigs. The judges in the stud pig classes were Mr. T. J. Collins, of the State Hospital, Newington, N.S.W., a man well versed particularly in the Berkshire breed; and Mr. A. F. Gray, New South Wales Government Instructor in Pig Raising.

Berkshires were prominently represented, and created a very favourable impression; in fact, the senior animals in this breed were almost without equal at any Australian Show.

Plate 158.

"Grafton Trump." Messrs. M. Porter and Sons' Reserve Champion Berkshire boar. R.N.A. Exhibition, Brisbane, 1934; also Championship winner, Wondai and Murgon. "Grafton Trump" was bred at Grafton Experiment Farm, New South Wales, from imported strains, is the sire of many Champions and prize-winners.

"Yanco Boscer," 11686, bred by the Riverina Welfare Farm, repeated his success at Sydney Royal, and carried off the breed championship and Herd Book ribbon. Since his purchase by Mr. J. Barkle for Queensland after last Sydney Show, he has secured championships at Toowoomba Royal (in keen competition there as well as at Brisbane), Oakey, Dalby, and Kingaroy, the only shows at which he was penned. This is a very fine son of "Navua Chamelion," having as his dam, "Yanco Beautiful." The reserve champion boar and last year's champion in same class was "Grafton Trump," 10722, owned by M. Porter and Sons, Wondai. This boar was bred at

Grafton Experiment Farm, and is a son imported in utero of "Pygmalion 5th," 10127, from "Highbury Fair Lady 2nd," 10126. He is a very fine representative of the latest British type.

A son of his, "Roselock Trumpet," 11374, bred by M. Porter and Sons, Wondai, and exhibited by the Wide Bay Stud Piggery, annexed the third award. He also has won championships at other shows, and like "Grafton Trump" is well known. The other ex-champions in the same class were "Caralulup Harry," 10020, bred in Victoria, and a champion at a number of Queensland Shows; "Goodna Aviator," shown by Goodna Hospital, and a prize winner of note; "Cawdor Happy Lad," 11603, champion at the recent Ipswich Show; and "Gatton Premier," who has worn prize ribbons on many occasions.

Several boars and sows were shown by Mr. F. Bach from his "Whipling Amelia 2nd" (imp.), 12103, and again brought forward imported strains of much value.

PLATE 159.

"Roselock Lila." Mr. Mat. Porter's prize-winning sow. Champion, Brisbane 1932; First and Reserve Champion, 1931. Reared litter of nine out of twelve. Exhibited Brisbane Exhibition, 1934. A fine type of breeding sow.

The imported sow, "Linton Patience," 12102, bred from "Bridge Poppy," 11504, and sired by "Hillsborough President," 3519, at the stud of S. C. Armitage, Linton Fields, England, secured the premier award in the female classes, and also first award in sow and litter class, in which there were several nice families. She secured the Herd Book ribbon, and in some measure repaid Mr. Bach for expense incurred in importing his two sows. "Whipling Amelia" secured first prize in a keenly competed class, and most of the breeders considered she should have been awarded the reserve, an honour that fell to Mr. O. L. Klein's entry, "Kapleton Dora," 11036. The Berkshire sows were a very fine lot. Last year's champion, Mr. Mat Porter's sow, "Roselock Tessie," was this time shown with a fine litter of twelve and secured second in that class, and third in the class for sows over 21 months. There

were approximately 175 Berkshire sows, and it was remarked there were no tail enders.

Large Whites.

The champion Large White boar, shown by Gatton College, again brought forward imported strains, for he, "Norfolk King David 5th," 1687, is a son of the imported "Wall King David 14th," 953, from that fine sow, "Spalding Baroness 11th" (imp.), 951. The reserve champion boar is a son of "Wall King David 48th" (imp), from Hon. T. H. Paynes' Woodburn Stud in Victoria, who imported several prominent animals from England. Other interstate studs represented among the prize winners included the Finchley and Vaucluse herds in Victoria, the Queensland Agricultural College and High School stud at Gatton, Queensland, in which there are also several stud animals from the Southern States, and the stud of J. A. Heading, of Murgon. Mr. Heading has New Zealand strains in addition to those from Victoria; in fact "Pine Terrace Pear" (imp.), 1220, carrying Canadian blood, annexed the female championship and Herd Book ribbon, while the

Plate 160.

"Roselock Tessie." First and Champion R.N.A., Brisbane, 1933; third prize winner, 1934. Second prize with litter of twelve, Brisbane, 1934. First Wondai, second Murgon, and Maryborough, 1934. A classy sow and a proved mother. Owner, M. Porter and Sons, Roselock, Wondai.

reserve champion is a granddaughter of imported parents. "Norfolk Bonetta 4th," 2011, another daughter of the imported "Wall King David 14th," carried off first prize in her class with litter. A daughter of "Spalding Superior 21st" (imp.), 2098, by "Tockwith Prince George 37th," 77923, was a very close runner-up for first place in her particular class. Approximately 90 Large Whites were penned, easily the largest and most exemplary display of stud animals in this breed yet penned north of Sydney.

Middle Whites.

The progeny of imported blood secured the five principal awards in the Middle White breed, the champion boar, "Norfolk Defiance 3rd," 4596, a son of that grand old boar, "Norfolk Nobleman," 3993 (last year's champion) ex "Norfolk Fuchsia 2nd," 4407, being a typical

illustration. He was shown by Mr. J. J. Slack. The entry of Mr. G. W. Winch, "Ferndale Victor," 4807, from the stud of I. M. Cash and Sons, in Victoria, secured the place of reserve and second in the aged class, and is a son of "Dookie Moral," from "Ferndale Pearl," a prize winner of note, like her sire and his stud. Mr. J. J. Winterbottom's stud secured a place with a boar penned by Mr. J. J. Slack. This boar was first in his class at Sydney, and had to face even keener competition at Brisbane, where he had to be content with third place. Mr. Cash's stud was represented also in other classes. Mr. Charlish's stud came in for much comment when "Norfolk Poppy 3rd," 4609, won the championship and Association's ribbon. She is a daughter of "Amport Fuchsia 9th" (imp.), 4182, and had as a very close runner-up the reserve sow, "Norfolk Bonnie 1st," 4588, a daughter of "Pendley Deliverance" (imp), 4190, an imported sire who has done much for the breed in this country.

Queensland urgently needs fresh strains, however, in this and the Large White breed, in order to maintain type and conformation and keep the breed up to its highest standard. The showing of Middle Whites was the best staged at Brisbane for at least fifteen years, and indicates the progress being made. It is of additional interest to note that a boar offered for sale by Mr. Cash realised highest price at the sales, 22½ guineas, and a sow sold by Mr. J. J. Slack at 19 guineas topped the prices for sows in all breeds offered.

Tamworths.

Mr. A. F. Gray judged the Tamworths, Wessex Saddleback, and Middle Whites, while Mr. Collins handled the Berkshires and Large Whites. Mr. M. Moffatt, of Billinudgell, annexed the male championship in this breed with a son of that very fine imported sire, "Whittingham Red Start," 1366, the boar being bred at Wollongbar Experiment Farm, New South Wales. It would be but fair to say that these imported strains have exercised a very considerable influence for good in the pig-raising industry in Australia, especially as the bulk of our prize-winners carry imported blood in their veins, and most of it imported within the last ten or twelve years.

"Wattledale Sandy," shown by Mr. J. Barkle, won a very well-merited reserve ribbon; in fact, he was quite good enough for the premier award, and in much better breeding condition, although the champion was in better form in that respect at this than at former shows. A son of "Milton Luck 3rd," imported from "Berkswell Constance 15th" (imp.), 1798, shown by Mr. H. B. Kerner, was placed.

That "Berkswell Constance 15th" (imp) is a good importation is again proved by the fact that her daughter, "Warringal Precocious," 1924, sired by "Milton Luck 3rd," won the championship in female classes, and was generally regarded as the best sow that has yet been shown in this breed at any Australian Show. Mr. Barkle also secured the reserve Tamworth sow championship with his "Wattledale Queen," sired by "Glenburra Bill," a champion of former days. "Warringal Carnation," 2159, a daughter of "Berkswell Constance" by "Baulking Golden King" (imp.), 1800, was also penned. There were approximately 80 Tamworths penned, comprising a very attractive selection, and emphasising that we have in Australia some of the best Tamworths in the world.

Wessex Saddlebacks.

Imported strains again came to the fore in this recently imported breed, the champion sow being "Holmsleigh Ace" (imp.), 2, bred by H. Losmore, of Devon, England. A son of hers, sired by "Holmsleigh Pioneer" (imp.), 1, secured the championship in the male classes, while progeny of these and others annexed important awards, the imported sire, "Holmsleigh Surprise" (imp.), 10, being runner-up for championship, and "Maiden Beech Ringouzel 9th" (imp.) annexing that position in the female classes. Although sons and daughters of these imported parents were shown in larger numbers than at former shows, there is as yet an insufficient number of animals available in this breed to enable it to make much progress or to demonstrate its capacity to produce and rear large litters. Mrs. A. Alford, Mr. R. Turpin, and Mr. C. F. Marshall were the only exhibitors.

Further comments and pictures of prize winners in the Pig Section will be published in the next issue of this Journal.

A GATE THAT WILL NOT SAG.

A Southern farmer supplies an agricultural paper with this splendid idea for a gate that will not sag. Thus he writes:—"Before sawn timber got plentiful in the backblocks, various were the styles of gates. Every owner seemed to have a different style, and some of them were very ingenious. Where timber is plentiful, and particularly in the mulga country, the following, I think, will be useful:—

"Cut a limb or two with a protruding fork in the following shape:—

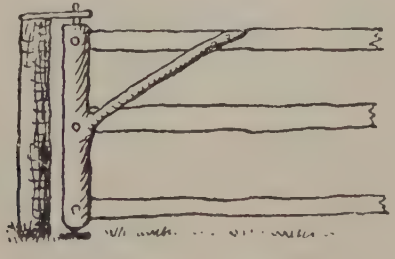


Plate 161.

"It will easily be seen that the fork, being part and parcel of the post, it would be impossible for it to sag. In any road gates I have always used 3 by 1 timber and rabbit netting. Use of the latter saves a lot of weight, and can be easily put in between the battens, which are held together by bolts. I put up a set of drafting yards in the Cunnamulla district in Queensland and, of course, there were the usual number of small gates, and I found this style very effective."

The 1934 Brisbane Exhibition.

PLATE 162.—THE JOURNAL AT THE SHOW.

The "Q.A.J." Information Bureau in the Agricultural Court at the Brisbane Show was the distributing centre of information on Departmental activities—a service much appreciated by farmers visiting the Exhibition. Mr. A. C. Boyle is the young officer in charge.

PLATE 163.—A FLEECY EMBLEM OF OUR WEALTH IN WOOL.
Queensland's fine merino wools are unexcelled in any other country.

PLATE 164.—QUEENSLAND LINT FOR AUSTRALIAN LOOMS.

Cotton-growing is developing into an industry of major importance, and the spinning industry is already an appreciable factor in the economy of the Commonwealth.

PLATE 165.—QUEENSLAND GROWN TOBACCO AT THE BRISBANE SHOW.

This display of leaf from the State's tobacco lands was definite proof of their capacity to produce high quality tobacco acceptable to manufacturer and consumer alike.

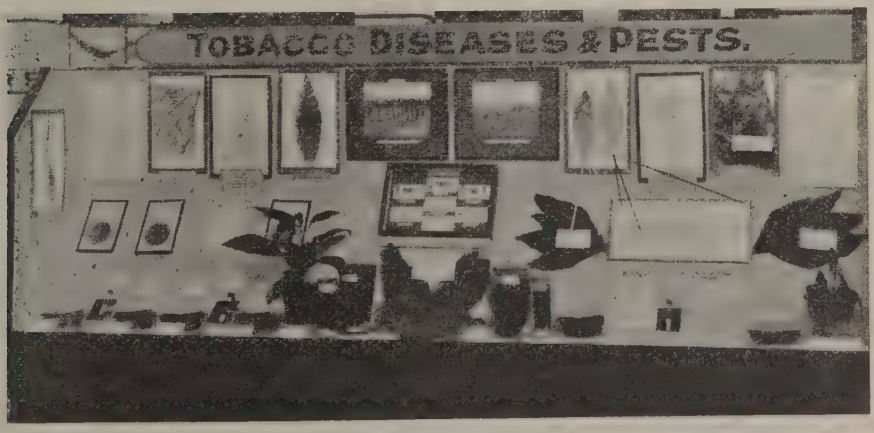


PLATE 166.

The Queensland tobacco grower is well served by the Science Branch of the Department of Agriculture and Stock.

PLATE 167.
An Instructive Panel in the Departmental Court.

PLATE 168.—THE SUGAR BAY IN THE AGRICULTURAL COURT.

Our photographer found it difficult to get an effective picture of this fine exhibit, arranged by the Bureau of Sugar Experiment Stations in conjunction with the canegrowers' and sugar producers' organisations. In the centre section a scale-working model of a mill attracted crowds daily throughout Show Week.

PLATE 169.—AN IMPRESSIVE PANEL OF THE SUGAR EXHIBIT.

In the foreground is a model refinery on a river frontage with wharf stacked with sugar bagged for shipment. A diorama forms the background on which is depicted the spires, domes, and factory chimneys of a great city, to the wealth of which the sugar industry is an important contributor. The panel is also suggestive of the interlocked relationship of rural and urban enterprise.

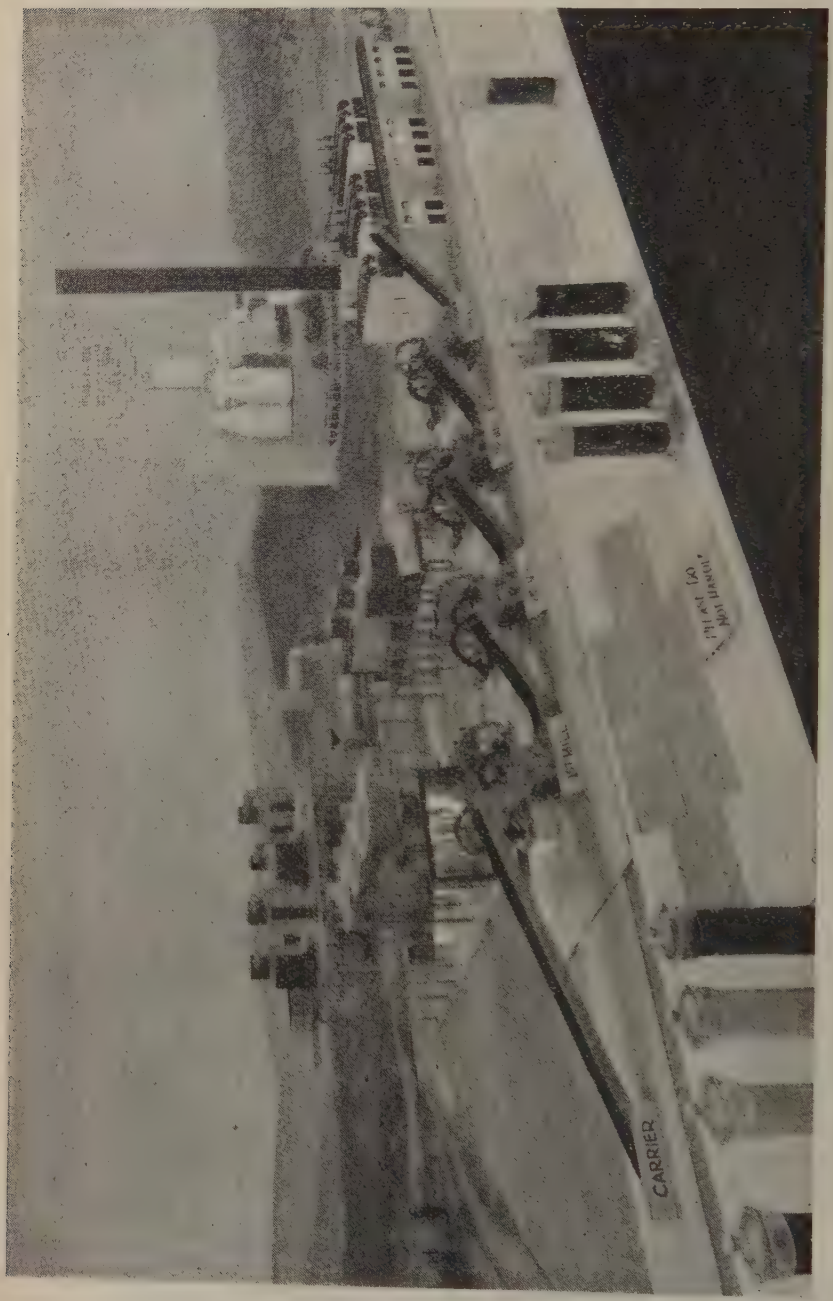


PLATE 170.—A WORKING MODEL OF A QUEENSLAND SUGAR MILL.

This model, constructed to scale and showing every factory operation in miniature, was the centre of keen public interest throughout Show Week. In this and adjoining sections the whole story of sugar was illustrated, beginning with the standing jungle and passing through every phase of farming, to milling and finally to the refinery and bagged and stacked sugar for shipment at the waterside.

PLATE 171.—SUGAR AT THE SHOW.

These stools of standard cane varieties, grown in the Burdekin Delta, attracted keen interest at the Brisbane Show.

PLATE 172.—A CEREAL STORY IN SHEAVES AND GRAIN.
This interesting panel in the Department Court illustrated the success of the plant breeders' efforts to evolve a wheat suitable for Queensland's climatic conditions of summer rainfall.

PLATE 173.—QUEENSLAND MAIZE.

This display at the Brisbane Show was an impressive object lesson in maize-breeding and production in this State. It represented the national value of the work of Departmental plant breeders in the evolution and fixation of types that have quadrupled our grain yield. Maize-growing is now one of Queensland's major agricultural industries.

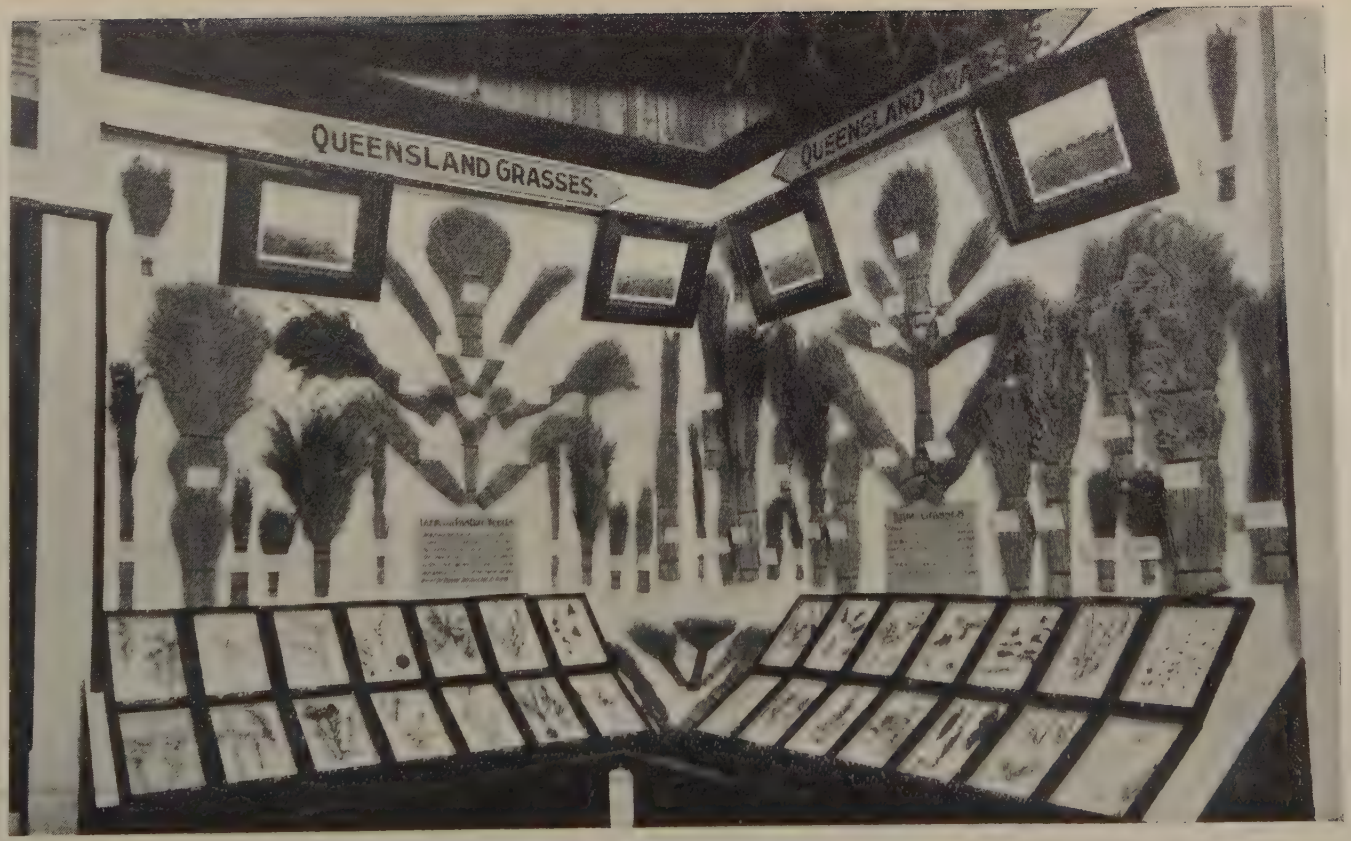


PLATE 174.—ALL FLESH IS GRASS.

These samples of Queensland pastures panelled in the Agricultural Court at the Brisbane Show illustrate the extensive range of nutritious indigenous grasses and herbage from which is derived most of the wealth of the State.

Plate 175.—Fodder Plants Panelled in the Agricultural Court.

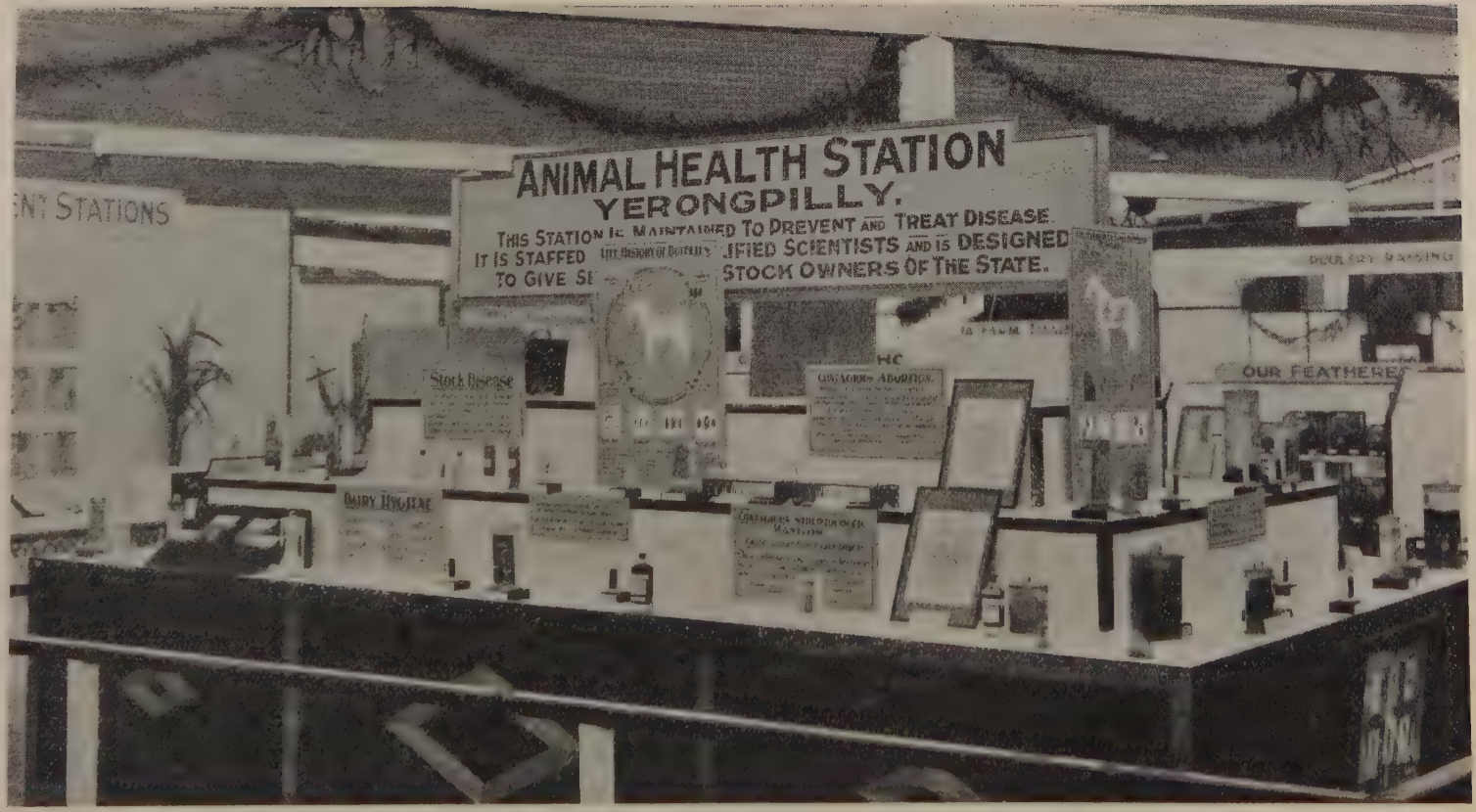


PLATE 176.—IMPORTANCE OF PATHOLOGICAL RESEARCH DEMONSTRATED.

The Animal Health Station is controlled by the Department of Agriculture and Stock, with the assistance of an advisory board consisting of representatives of the Department, the Queensland University, the Council for Scientific and Industrial Research, the medical profession, and farming interests.

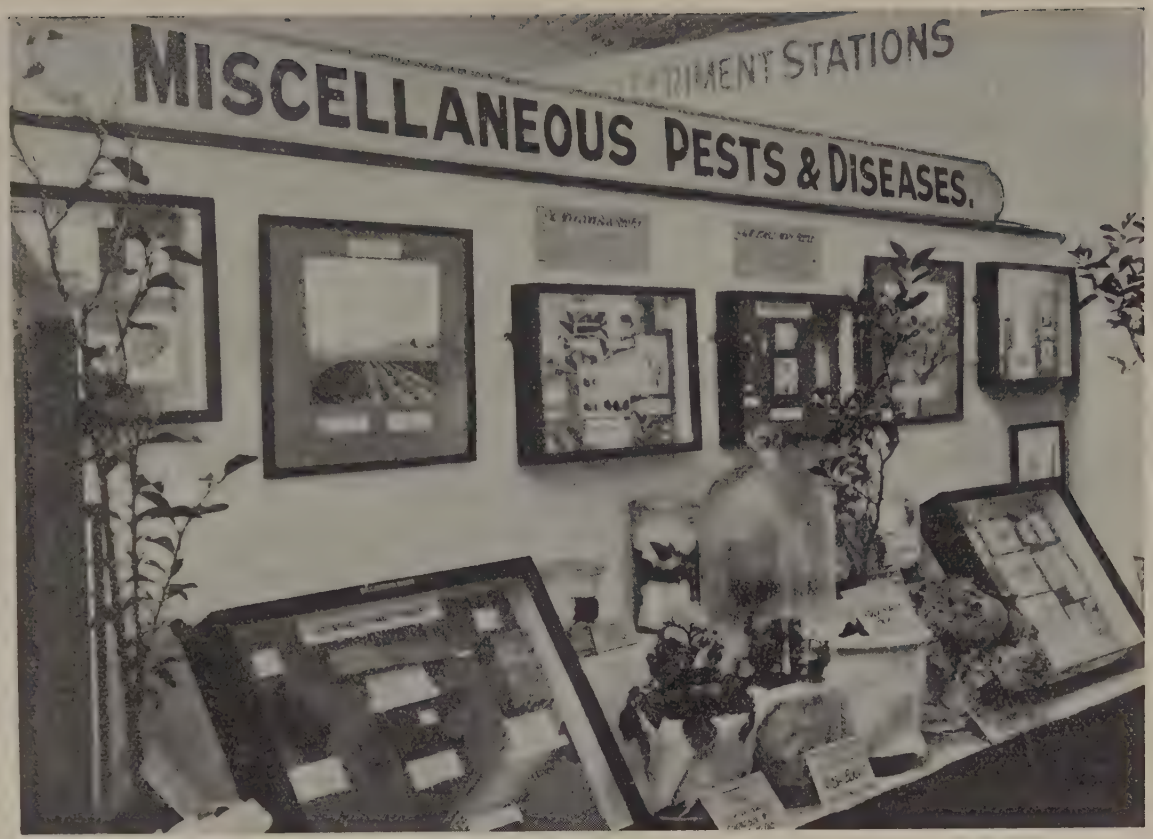


PLATE 177.—SCIENCE AND AGRICULTURE.
This and other exhibits of the Entomological Branch and its Pathological Section was illustrative of the extent and value of the scientific services available to Queensland farmers.

PLATE 178.—FRUITS OF THE CENTRAL BURNETT.

While both temperate and sub-tropical fruits are produced prolifically in the Gayndah District, its citrus groves have won for it the great reputation it enjoys on the markets of the Commonwealth as a great fruit growing region. This exhibit was awarded first prize in the Citrus Fruits Section with a score of 86¾ points.

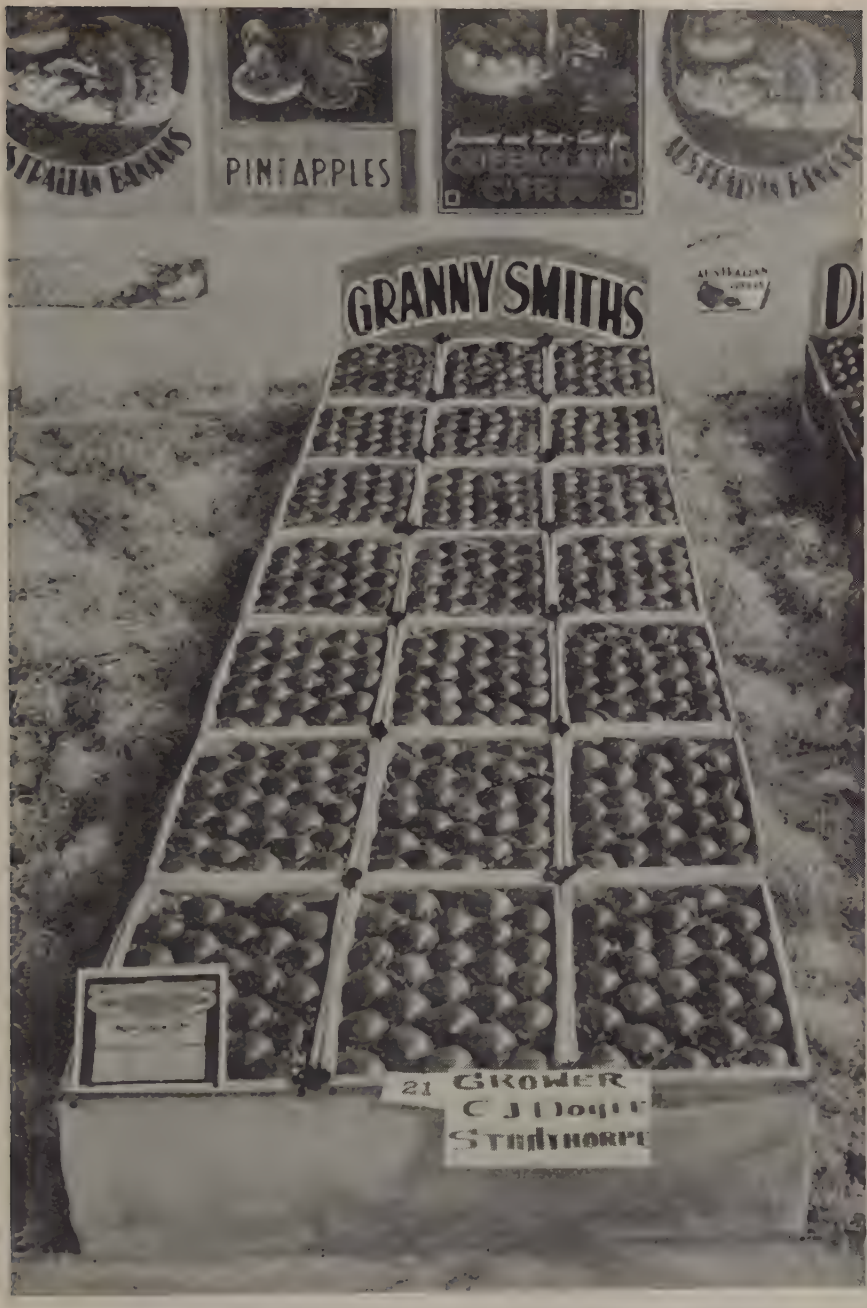


PLATE 179.—APPLES FROM THE FRUITFUL GRANITE.

This was the winning exhibit in the apple trophy (20 to 25 cases) class at the Brisbane Show, grown by Mr. C. J. Doyle, near Stanthorpe. The fruit was in excellent condition, competing successfully against exhibits of Jonathans, Sturmers, and Democrats from New South Wales and Tasmania.

PLATE 180.—THE WEALTH OF QUEENSLAND'S TROPICAL PROVINCES.

The producers of the Charters Towers and Mackay Districts combined in presenting this remarkable array of the products of tropical coast and temperate tableland. No finer evidence of the richness of North Queensland in agricultural, pastoral, and mineral resources could be submitted. This exhibit won the "A" Grade District Competition.

PLATE 181.—THE WEALTH OF WEST MORETON.

The winning display in the "B" Grade District Competition at the Brisbane Show. This remarkable exhibition of the products of field, mine, and factory from one of the richest provinces in Queensland, and of which only a portion came within camera focus, was one of the most popular pavillion features.

Marketing Oranges at Home and Abroad.

By JAS. H. GREGORY, Instructor in Fruit Packing.

(*Continued from page* 132, *Vol. XLII., Part* 1—*July.*)

PART III.

PACKING THE EXPORT CITRUS CASE.

THE Export Citrus Case (24 inches long by 11½ inches wide by 11½ inches deep clear of partition) is made up with a partition, there being two compartments, each with internal dimensions 12 inches by 11½ inches by 11½ inches. The following packing table is used, the packs being given for one compartment only, the total representing the quantity in the completed two compartments:—

Approx. Size.	Pack.	Layer Count.	No. of Layers.	Total.
2½	3—3	4 x 4	6	288
	3—3	4 x 3	6	252
2¾	3—3	3 x 3	6	216
	3—2	4 x 4	5	200
3	3—2	4 x 3	5	176
	3—2	3 x 3	5	150
3¼	3—2	3 x 2	5	126
	2—2	4 x 3	4	112
	2—2	3 x 3	4	96
	2—2	3 x 2	4	80

Care should be taken to pack each compartment with the fruit at the ends of the case almost level with the top of the end, whilst the fruit is up to 2 inches in height in the centre at the partition. This gives a natural bulge for the lid of about 1½ inches in the centre when nailed. A cardboard guard for the fruit is placed over the partition to assist in keeping the fruit from being damaged by the rough edges of the partition board.

Width of Boards in Made-up Case.—The boards of the sides, tops, and bottoms should not be more than half an inch apart when nailed on. Enough space should be allowed to permit free ventilation of the cold air through the case. The following is the size of timber necessary to make up the case:—

Ends and Centre Piece—Three pieces 11½ inches wide by 11½ inches deep by ¾ inch thick.

Sides and Bottoms—Six pieces 26¼ inches long by 5¼ inches wide by $\frac{5}{16}$ inch thick.

Lids—Two pieces 26¾ inches long by 5¼ inches wide by $\frac{3}{16}$ inch thick. The lid is made longer than the sides to permit the bulge.

Cleats—Two pieces 11½ inches long by ¾ inch wide by $\frac{3}{16}$ inch. thick.

Packers observing the following rules should have no difficulty in obtaining good results with their packing.

1. To ensure protection from stalk marks when packing, all fruit should be placed on the cheeks, facing end to end in the case, so that the stalks are then resting in the pockets.

2. Reverse the last line of oranges in each layer.

3. See that all fruit appears in straight lines from end to end in the case, across and diagonally.

4. No two oranges must rest directly one upon the other, but in the pockets of the layer beneath.

5. The size of the pockets governs the height of fruit in the case.

6. Do not use, unless absolutely necessary, any of the intermediate counts in Tables "B" and "D."

7. Reject all blemished or damaged fruit—"If in doubt, throw it out" is a good maxim. Make a second grade for blemished fruit.

In conjunction with the rules for packing, growers should observe the following rules whilst handling:—

1. Use gloves for all operations when packing for export. One glove only need be used, being on the hand handling the fruit.

2. Clip all fruit with the special commercial type of blunt-nosed citrus clipper, and on no account pull fruit from the trees. Don't use unsuitable clippers, such as scissors.

3. Where necessary make a second cut to remove any surplus stalk left on the fruit after removal from the tree. It is preferable to make two cuts and do the work properly.

4. Do not harvest fruit in damp, humid weather.

5. Transfer by hand fruit from one container to another whilst picking, sizing, &c.; do not roll or tip fruit.

6. See that all handling receptacles and machinery have no projections, screws, or splinters, of any kind that would be likely to injure the fruit.

7. Sweat all fruit before packing; this will ensure tight packs on arrival at the market.

8. Do not leave old, decaying fruit lying about the packing house or in cases, &c., used in the handling of the fruit.

9. Spray the sizing machine daily with a 1 in 20 solution of formalin; sheds, particularly floors, should be cleaned and sprayed regularly once a month; if export packing for overseas markets, the sheds should be sprayed weekly.

10. Do not sit or stand on cases of fruit when carting or handling, drive fast over rough roads, or stack carelessly on carts, trucks, &c.

11. Do not pack dirty fruit or fruit picked from the limbs near the ground.

12. For preference do not use picking bags. A proper picking bucket is better for careful handling.

13. Do not pack sour, immature fruit; it will only spoil the sales of the following consignments.

14. Take care to place battens under the case ends when nailing down cases.

15. When packing for overseas markets do not send too large or too small oranges away; counts 126 to 216 give a good range of sizes.

General Notes.

Sweating.—Before packing for export, oranges should be thoroughly sweated or cured by being harvested and stored in a cool place for five to ten days, according to the state of the weather, temperature, and ripeness of the fruit. This is necessary to overcome the shrinkage that is often experienced when fresh fruit is packed and sent to local market and remains unsold for a few days. Whilst the sweating of fruit is not absolutely necessary when growers are near their local market, nothing is lost if the fruit is held for two days before packing, the longer period up to ten days being necessary when sending long distances. Sweating is often of assistance also in eliminating fruit fly and otherwise damaged fruit.

Wiring.—It is recommended that all cases of first-grade fruit be wired. Care should be taken to wire the cases correctly. The wire should be placed around the case about a quarter of an inch inside from the inside edge of the case end. It is essential that wires be not placed around the middle of the case where the fruit will be squeezed when tension is placed on the wire. A machine is obtainable commercially which carries out this operation quickly and efficiently. Many country-order buyers pay a little extra and give preference to purchasing wired cases, as it saves them time and money when they can secure cases ready wired for long-distance transport. It can be seen from this that wiring can be a help in giving a sales preference to a grower's fruit on a slow market.

Case "Get-up."

Labels.—Having taken care in packing, growers should complete a good job by giving careful attention to the outside appearance of the finished case. A well-chosen fancy label is an attraction and an asset, being a cheap advertising medium, the average coloured label costing very little. Growers not marketing fruit in sufficient quantity to warrant an outlay on labels may still make their cases look attractive by neat stencilling. Where growers as individuals are not in the position to obtain labels, an economical means of obtaining the use of a label is for a number to join together and obtain a designed label with a common district brand design, only the grower's name and address (which could be added by rubber stamp) differing on each grower's label. This enables a quantity of labels to be procured, thus cheapening the cost. A label must have the grower's or packer's (i.e., packing house) name or brand and address, the address to include the word "Australia" in ½ inch letters. Spaces should also be left to include the variety, number or size of fruit, and grade standard; rubber stamps can be procured to insert these particulars after packing. It is recommended to brand on the label the count in preference to the size.

Good flour paste is satisfactory for applying labels. The paste is applied to half a dozen case ends at a time. The labels, which are soaked in a can of water, are drained and given an application of paste on their backs, placed on the pasted ends, and gently rubbed with a damp rag. A satisfactory paste is made from flour as follows:—Take 1 lb. flour, ½ oz. alum, and 1 pint water. Mix into a thick paste and then add boiling water until the paste thickens, stirring all the time. If too much boiling water is added, making the paste too thin, boil slowly, adding a little more flour. If to be used immediately the paste can be made without the alum or by adding a small quantity of bluestone as a preservative can be kept for short periods.

Stencilling.—If using stencils only and marketing in Queensland, under the Fruit and Vegetables Act it is necessary for the packer to brand his initials, name and address, legibly and durably within a space measuring not less than 5 inches long by 2 inches wide. The name of the variety of fruit and the size or count must also be branded in letters of not less than half an inch in height. When sending overseas the word "Australia" must be included in the address.

Branding.—Cases should be branded so that as little confusion as possible is caused to loaders and checkers during transit. A good system is to brand as follows:—

One End—Shipping or Agent's Number.

Examples:

409 LONDON

(Export)

W.A. 12 BRIS.

(Local)

Other End—Grower's name and address, Variety, Number, and Grade.

Example:

J. JONES, Palmwoods, Queensland, AUSTRALIA. SPECIAL W. NAVELS 126

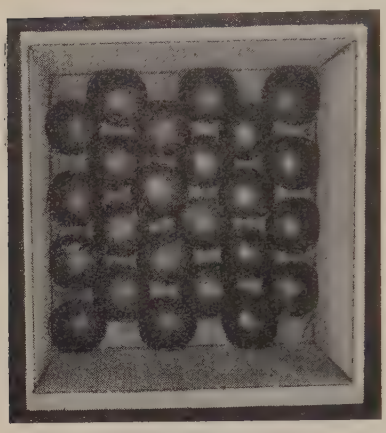
(Export or Local Market)

Good branding should be neat and should not show stencil ink smudges from running the brush over the edges of the stencil plate; make your stencils with a good margin around the lettering.

As the whole basis of successful marketing is care, growers should follow this principle right to the finish of their share of handling. Remember! Good packing, fancy labels, wiring, or stencilling will not sell bad fruit! All the care taken in putting up a first-grade, attractive package will be of no avail if growers, while carting the fruit to the station and loading into the trucks, do not handle it carefully. Too often we see carters sitting in the middle of packed cases of fruit while on the road, or walking all over packed cases whilst loading into railway trucks. Even good packing will not stand abuse, and so, in closing, every grower, carter, &c., is urged to handle the fruit from the tree to the consumer in the same manner as he would handle any delicate thing entrusted to his care. This should then enable us to get that return for which we strive for twelve months in and out of the orchard.

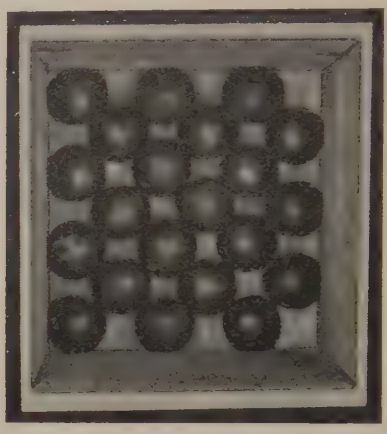
CITRUS EXPORT CASE.

First Layer.
3-3 Pack, 4 x 4 Layer Count.
6 Layers = 288.



Total, 288.

First Layer.
3-3 Pack, 4 x 3 Layer Count.
6 Layers = 252.



Total, 252.

NOTE.—These first layers only represent a single compartment of the case. Each complete case contains two compartments which must be packed uniformly to obtain the correct count.

Finished Case.
Side. Top.

3-3 Pack, 288 Count.

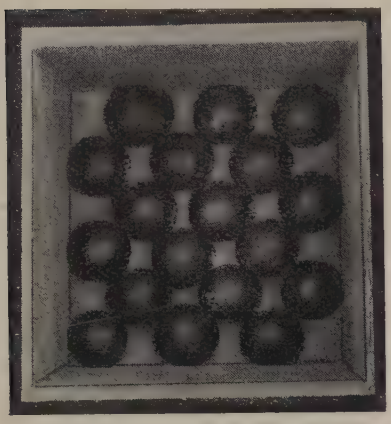
Finished Case.
Side. Top.

3-3 Pack, 252 Count.

PLATE 182.

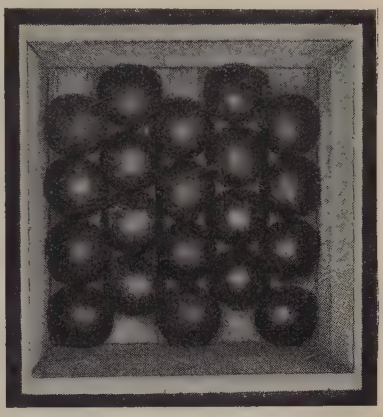
CITRUS EXPORT CASE—*continued.*

First Layer.
3-3 Pack, 3 x 3 Layer Count.
6 Layers = 216.



Total, 216.

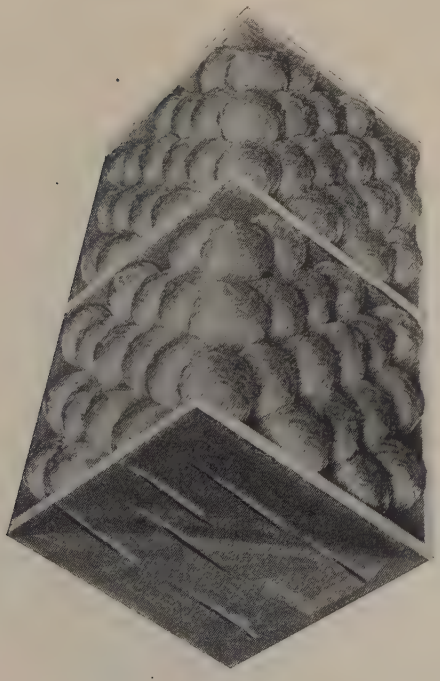
First Layer.
3-2 Pack, 4 x 4 Layer Count.
5 Layers = 200.



Total, 200.

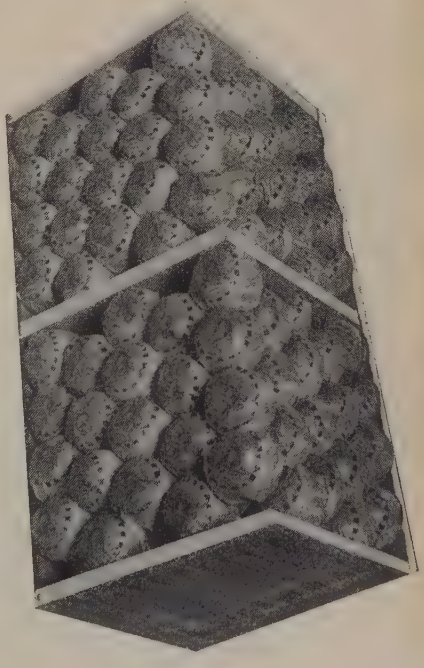
NOTE.—These first layers only represent a single compartment of the case. Each complete case contains two compartments which must be packed uniformly to obtain the correct count.

Finished Case.
Side. Top.



3-3 Pack, 216 Count.

Finished Case.
Top. Side.



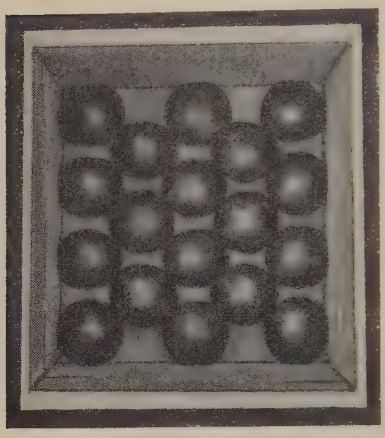
3-2 Pack, 200 Count.

NOTE.—This fruit is wrapped with the Australian Export Kangaroo Wrapping Paper.

PLATE 183.

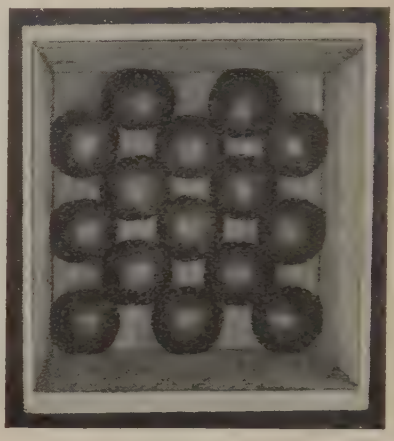
CITRUS EXPORT CASE—*continued.*

3-2 Pack, 4 x 3 Layer Count.
5 Layers = 176.



Total, 176.

3-2 Pack, 3 x 3 Layer Count.
5 Layers = 150.



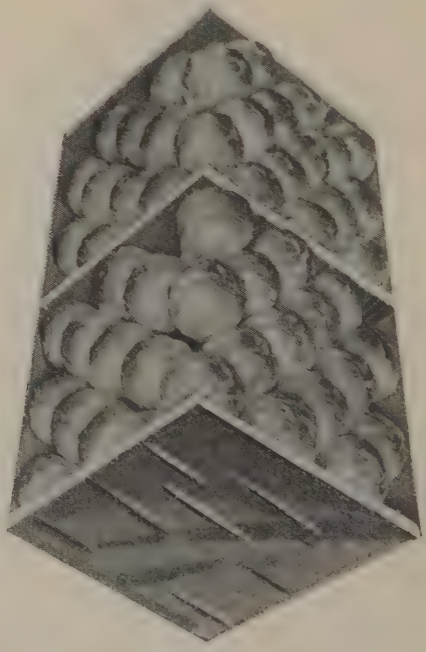
Total, 150.

NOTE.—These first layers only represent a single compartment of the case. Each complete case contains two compartments which must be packed uniformly to obtain the correct count.

Top. Side.

3-2 Pack. Total, 176.

Side. Top.

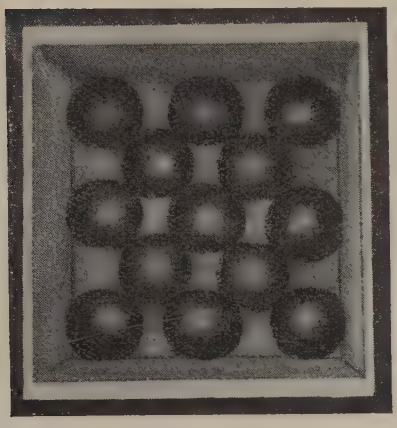


3-2 Pack. Total, 150.

PLATE 184.

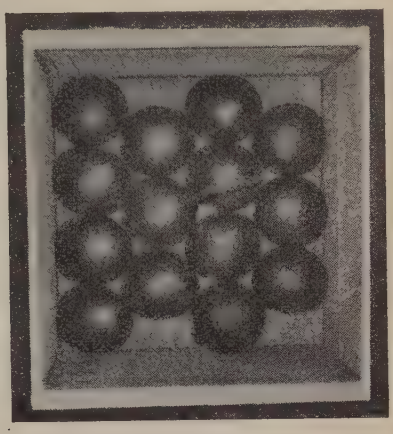
CITRUS EXPORT CASE—*continued.*

First Layer.
3-2 Pack, 3 x 2 Layer Count.
5 Layers = 126.



Total, 126.

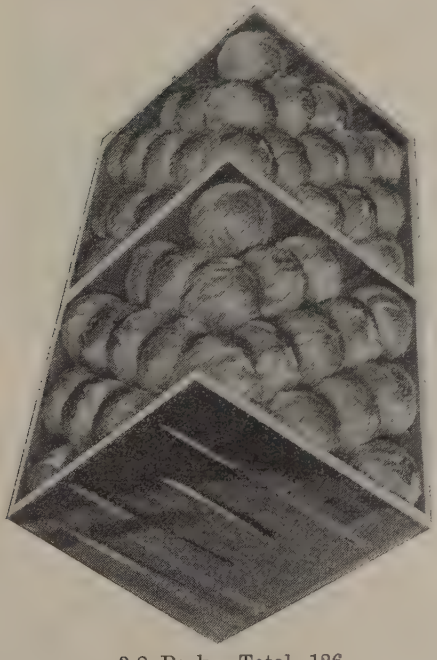
First Layer.
2-2 Pack, 4 x 3 Layer Count.
4 Layers = 112.



Total, 112.

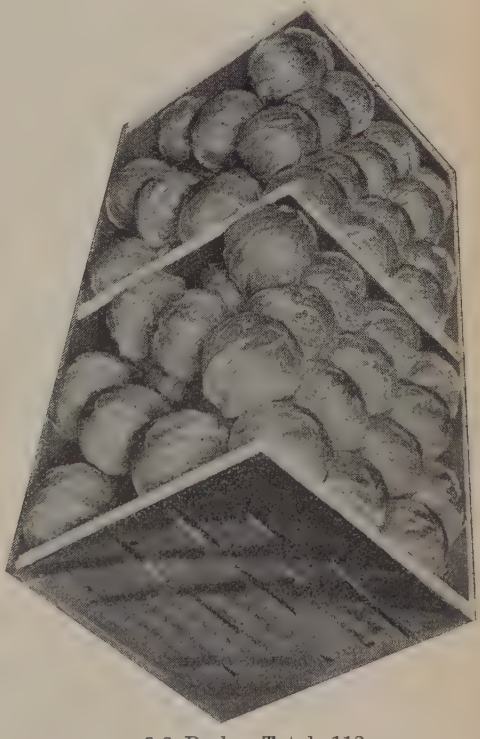
NOTE.—These first layers only represent a single compartment of the case. Each complete case contains two compartments which must be packed uniformly to obtain the correct count.

Finished Case.
Side. Top.



3-2 Pack. Total, 126.

Finished Case.
Side. Top.



2-2 Pack. Total, 112.

PLATE 185.

The Cowpea.

By N. A. R. POLLOCK, H.D.A., Senior Instructor in Agriculture.

THE genus Vigna of the natural order Leguminosæ, to which the species cultivated and known as cowpeas—though they are really beans—belong, comprises upwards of thirty examples which are widely distributed over the warmer regions of the globe.[1] Bailey[2] records four as Australian species, three of which have a wide range in other parts, while one is endemic.

The cultivated varieties of the cowpea are held to be derived from *Vigna sinensis,* a native of Central Africa, where, according to Piper,[3] wild plants little differing from those cultivated are still to be found.

The large number and diversity of cultivated varieties throughout Africa and the warmer parts of Asia and Europe suggest that the crop was cultivated for many centuries.

It is probable that the cowpea was included in the varieties of beans mentioned under the name Phaseolus by old Roman writers, since in Italy the name Fagiolo, the local equivalent of Phaseolus is applied equally to the Kidney bean and the Blackeyed cowpea.[4]

PLATE 186.—A COWPEA CROP ON A NORTH QUEENSLAND FARM.

In countries where the Spanish language is used, the cowpea is referred to as Frijole or Figole, which may also be considered a derivative of Phaseolus.

There are three main varieties of the Cowpea, viz.:—

Vigna sinensis var. *sesquipedalis.*

The Snake, Yardlong or Long Bean, also Asparagus Bean. This subspecies comprises a number of varieties, noted for their long, soft,

and puffy pods, which carry an elongated kidney-shaped seed. They are usually grown on sticks or poles, also without support, and the young pods used when green and brittle in the manner of French beans.

In tropical parts they are much favoured in the summer for culinary purposes. The pods of many of the cowpeas proper, however, are not only more palatable but capable of more economic production.

Vigna sinsensis var. *Cylindrica.*

The Catiang or Indian cowpea, as it is frequently called. This subspecies forms a group of varieties of semi-erect, half bushy plants with pods 4 or 5 inches long, carrying small, hard seeds usually oblong or cylindrical and slightly kidney-shaped. They are generally late in maturing, and on this account not generally popular. The Poona (see under varieties), however, is an exception.

Vigna sinensis.

The common cowpea, of which there are a great many varieties, and to which the balance of the subject matter of this article refers.

Climate.

The cowpea is essentially a summer crop, as it is easily killed by frost. Being a native of warm climates, it can be expected to make the best success in the more tropical parts of the State; but if sown as soon as danger from frost is over, good crops should be obtained in the cooler parts or where a crop of maize can be produced.

It will stand a moderate amount of dry weather, under which condition yield of forage and seed will be much reduced.

Under a heavy rainfall, while the volume of growth will be satisfactory, the yield of seed will be small. The bottom leaves also will be liable to mildew, owing to a poor circulation of air through the mass. Heavy or continuous rain when the pods are ripening is also apt to cause mildew in the seeds.

The best success can be anticipated when growth is made in the hottest months under a good rainfall and fine weather is experienced at harvest or when the pods mature.

Soil.

The cowpea will succeed on almost all types of soil that are sufficiently drained or do not become water-logged. Good crops can be anticipated when growth is made on sandy soils and intermediate types to heavy clays, provided a reasonable amount of plant food is present, the season is favourable, and satisfactory cultivation practised.

The necessity for lime in the soil, so general with most legumes, is less insistent in the case of the cowpea than with others.

On rich soils, a heavy growth of vine may be expected when the yield of seed will be comparatively low. Soils of medium fertility may be expected to yield the largest crops of seed.

Generally speaking, what is regarded as good maize land can be expected to produce the best crops of cowpea both in yield of vine and seed.

Cultivation and Sowing.

The soil should be well ploughed to a depth of at least 6 inches, cross-ploughed if necessary, and brought to a good tilth.

Sowings are usual of single seeds, 3 or 4 inches apart in drills spaced 3 feet apart.

Sown in this manner, 6 to 10 lb. of seed, according to its size, which varies with varieties, will be sufficient for an acre.

An ordinary corn-planter with a suitable plate is satisfactory for sowing, as is also a grain drill when sufficient of the cups are closed to allow of the required spacing.

In broadcast sowing, 20 to 30 lb. is sufficient on clean ground, but frequently larger quantities are used.

PLATE 187.—A CLOSER VIEW OF A COWPEA CROP.

When sown in this manner, it is advised to have the land somewhat rough and to fine it down with the harrows when covering the seed.

Cowpea seed germinates very quickly, the young plants frequently showing on the third day after sowing.

After cultivation consists in keeping weed growth down and the soil loose between the rows of plants while growth permits, usually over a period of four to five weeks if the season is favourable.

The ordinary cultivators, such as are used with maize, are satisfactory.

Harvesting—Hay.

The best time to cut the crop for hay is when flowering has progressed a little time and a fair quantity of pods have formed. Sometimes, in order to secure seed as well, the crop is left until most of the

pods have matured; the seed is then threshed out or secured from the sieves when cut into chaff. In the latter case the vines are more fibrous, and less leafage can be expected.

In making the hay, the growth should be placed in small, loose cocks as soon as possible after signs of wilting have appeared, so that the circulating air will assist in the transpiration of moisture from the vines through their leaves. After a day usually in the small cocks, two or more can be used to form a larger one until curing is complete. As the leaves afford the greatest nutriment, their retention should be the main objective.

Seed.

When ripe, the pods will assume a straw colour. At this stage rainy or extra humid conditions will cause the seed to mould or to sprout within the pod. The value of fine weather at this stage is therefore apparent.

Frequently, as the pods ripen progressively, especially with late-maturing kinds, it is found profitable to hand-pick the first setting and to secure the remainder by harvesting the plant. Early-maturing kinds usually ripen the majority of the pods within a short space of time, which allows the plants to be harvested and the seed secured by threshing, or from the sieves by cutting into chaff. When securing the seed in this manner it is of advantage to have the vines thoroughly dry and brittle.

When the pods are hand-picked they should be thorough dried, when they are easily broken and the seed secured. The proportion of seed is usually 70 per cent. of the whole pods.

Yields.

The yields of forage or seed of any variety will depend on the fertility of the soil and the season experienced.

Late-maturing varieties, owing to a longer growing period, can be expected to give much heavier yields than those of earlier habit.

From 3 to 4 tons up to 10 to 15 tons of greenstuff and from 3 to 4 up to 20 to 25 bushels of seed may be anticipated under reasonable conditions of soil and season.

Departmental trials in North Queensland over a series of years gave the following results:—

Variety.	Average Yield per Acre.	Number of Trials.	Highest Yield.
	Tons Cwt. Qr.		Tons Cwt. Qr.
Groit	12 0 0	15	22 10 0
Brabham	12 10 0	6	18 19 1
Victor	11 3 0	4	19 5 2
Black	6 5 0	2	6 6 0
Clay	6 0 0	1	

The highest yield of these were recorded as follows:—

Groit Variety.—Carbeen, sown 28th November, estimated 10th February; yield, 16 tons 11 cwt. in 74 days; after further growth estimated 17th April, yield, 22 tons 10 cwt. in 140 days.

Victor Variety.—Tolga, sown 23rd January, estimated 1st May; yield, 19 tons 5 cwt. 2 qr. in 97 days.

Brabham Variety.—Tolga, sown 23rd January, estimated 1st May; yield, 18 tons 19 cwt. 1 qr. in 97 days.

Uses.

Green Manure.—The use of the cowpea as a green manure is becoming increasingly popular, largely from the fact that it provides a big volume of growth in a comparatively short time. In common with most other legumes it adds, in addition to the organic matter, an appreciable quantity of nitrogen to the soil; this is demonstrated by the multitude of nodules formed on the roots by the nitrogen-fixing bacteria.

The greatest volume of growth is naturally afforded by the late-maturing varieties, suggesting these should be sown early in the season.

Quick-maturing sorts are valuable to follow a crop harvested in early summer.

Rotation.—The value of a legume in a sequence or rotation of crops is generally appreciated, not only when it is ploughed under to augment the supply of organic matter in the soil, but from the more vigorous growth of a succeeding crop caused by the added nitrogen from the decay of the roots after the top growth has been removed. Crops such as maize, potatoes, &c., following a cowpea crop, whether cut and removed or ploughed under, invariably experience benefit.

Culinary Use.—The green pods of many of the varieties when young and brittle are esteemed as a table vegetable. Use in this manner is particularly suggested in the summer of tropical parts when other beans, similarly used, cannot be grown.

The seed of many kinds, particularly those white or mottled white in colour, are also esteemed when mature and dry as a haricot bean.

Fodder.—Being a legume and consequently rich in protein, the fodder value of the cowpea at all stages of growth, whether fed green or cured as hay, is exceedingly good.

Combined with its high fodder value is extreme palatability, all stock eating it readily.

Henry and Morrison[5] present the following analyses:—

	Total Dry Matter in 100 lb.	Digestible Nutrients in 100 Lb.				Nutritive Ratio.
		Crude Protein.	Carbo-hydrates.	Fat.	Total.	1:
Seed	88·4	19·4	54·5	1·1	76·4	2·9
Hay before Bloom	92·2	17·8	27·0	1·0	47·0	1·6
Hay in Bloom to Early Pod ..	89·4	12·6	34·6	1·3	50·1	3·0
Hay Ripe Vines	90·0	6·9	42·1	1·0	51·2	6·4
Hay—All Analyses	90·3	13·1	33·7	1·0	49·0	2·7
Green Vines	16·3	2·3	8·0	0·3	11·0	3·8

The seed, it will be observed, according to the analysis, provides a valuable protein concentrate for feeding to all kinds of stock, including

poultry, though the latter do not often take readily to the whole seed. As the seeds of all varieties are relatively small, they should be crushed or ground to a meal before being fed to stock, and in this state added to the mash for poultry.

Grazing Off.—As a crop for grazing off at all stages of growth, the cowpea offers many advantages. Dairy cows and growing and fattening stock can be grazed for periods each day until growth has ceased, when that not consumed can be ploughed under with ultimate profit. Pigs can also be profitably raised when depastured thereon.

Hay.—When cured as hay a valuable roughage is provided, which can be fed whole or chaffed with other feeds to secure a desired nutritive ratio.

Silage.—The cowpea can also be successfully ensiled when combined with other crops such as maize or sorghum. Added to either of the latter an advantage is gained by the consequent increase of protein.

PLATE 188.—AS A COVER CROP, THE COWPEA IS AN IMPORTANT FACTOR IN FARM ECONOMY.

Cover Crop.—The cowpea has found favour as a cover crop with banana-growers and orchardists to keep down weed growth and to add fertility to the soil. Varieties of upright growth or those of short-running habit, such as the "large clay coloured," are favoured.

As a crop to precede the sowing of lucerne, the cowpea can be recommended, as not only is the land kept free of weed growth and a clean seed-bed provided, but it is inoculated with a nitrogen-fixing bacteria which appears to favour lucerne.

Mixed Crops.

The cowpea can be grown with advantage when the seed is sown mixed with that of other crops, either for grazing off, for silage, or for hay.

With Maize.—Where growth of maize is not too rapid as in the cooler parts of the State, the seed of early sorts can be sown immediately, after the last cultivation of the maize, in the centre between each row. In the warmer parts it is advised to sow both seeds at the same time in the same row, using later-maturing varieties of cowpeas.

The resultant crop can be cut for silage or grazed, or the maize grain can be harvested and the stock then turned in. The mixed crop is considered valuable for raising and fattening pigs.

With Sudan Grass, &c.—Sown combined with Sudan grass, various millets or sorghum broadcast, the addition of the cowpea will improve the fodder value, either when fed off or cured as hay. Both seeds should be sown at the same time. It is advisable, when sowing cowpeas in a mixture, to use those of less erect and more running habit of growth.

Varieties.

Varieties of the cowpea differ in their manner of growth as well as in the period in which they ripen the first pods. Some are early maturing, others late; some are inclined to erect or bushy growth with short runners, while others are procumbent with long runners. Intermediate forms between the two, of course, occur. Some varieties are valuable for their heavy yield of forage, others for the amount of seed they yield.

New Era.—Plants tall, half-bushy, and of vigorous growth. Yields seed freely. Matures medium early, the first pods ripening in about 70 days. Seeds rather small, buff coloured, and speckled with blue.

Whippoorwill.—Plants tall, sub-erect, and half-bushy, giving an abundant growth—a good general purpose kind—matures the first pod in about 80 days. Seed buff coloured, marbled with brown. Pods tend to cluster, which facilitates hand-picking.

Groit.—Regarded as a cross between New Era and Whippoorwill[4] and considered superior to both. It is much favoured in North Queensland. The plants are sub-erect, half-bushy, and of prolific growth. The first pods ripen in about 75 days. Seeds somewhat small and angular, buff in colour, marbled with brown, and thickly sprinkled with bluish spots.

Brabham.—Regarded as a cross between Iron and Whippoorwill varieties.[4] It has done well in the North. The plants are fairly tall, half-bushey, and very prolific. The first pods ripen in about 85 days. Seeds buff in colour, marbled with brown. This variety is regarded as resistant to nematode attack.

Iron.—Plants tall, half-bushy, of moderate growth, and not a free seeder. It is extremely hardy and late in maturing, the first pods ripening after about 90 days. Seed pale-yellowish to reddish-buff. This variety is regarded as resistant to nematode attack.

Victor.—An artificial cross between the Brabham and Groit varieties, originated by the United States Department of Agriculture.[4] Plants tall, half-bushy, and very prolific. The first pods mature in from 80 to 85 days. Seed small brownish-buff and covered with small blue specks. Said to resist nematode attack. It has done well in the North.

Early Clay.—Plants sub-erect and bushy—fairly prolific. An early variety, the first pods maturing under 60 days. Seeds light-buff with a suggestion of pink. The variety, being one of the earliest, is most suitable for the colder districts of the south.

Early Black.—Plants rather procumbent and viney, but yield abundantly. The first pods mature in about 60 days. Seeds black. The variety is suitable for growth with maize or other crops for conservation as fodder or for grazing off. There are a number of varieties with a black seed which vary somewhat in habit of growth and the period of maturity.

Blackeye—Mottled White—Cream and White.—These varieties are regarded as inferior for fodder purposes, and are usually grown for the seed, which is esteemed for table use.

Fertilizers.

Where the soil gives an acid reaction, a top-dressing of lime at the rate of 10 cwt. per acre, or carbonate of lime (earthy lime) at the rate of 20 cwt. per acre, should be applied broadcast to the soil prior to sowing the seed. Though lime is not called for so insistently as in the case of lucerne, its application will be attended with profit on many soils, more especially those in districts of heavy rainfall. Poor soils, such as those of very sandy nature on which the production of bright tobacco is advised and soils somewhat exhausted by continuous cropping, will be benefited by the application of fertilizer. On the more fertile the inclusion of nitrogenous fertilizers is not imperative, as on these soils little benefit is received therefrom, but on those of poorer quality it will be most beneficial. The following mixtures are suggested for each 100 lb.:—

For poor soils—Sulphate of ammonia, 10 lb.; superphosphate, 75 lb.; sulphate of potash, 15 lb.

For better soils in which the humus content is fair—Superphosphate, 85 lb.; sulphate of potash, 15 lb.

Applications may be made at from 100 lb. to 300 lb. per acre, preferably in the drill at the time the seed is sown.

Diseases.

So far in Queensland little trouble has been experienced from disease in cowpea crops beyond slight leaf-spots and the moulds formed on leaves and seed under heavy or prolonged falls of rain.

In other countries trouble has been experienced from wilt caused by a fungus which invades the roots, and, by impeding the flow of sap, causes a wilting and subsequent drying off of the top growth.

Nematodes.

Several varieties are subject to attack from eelworms or nematodes, which form gall-like swellings on the roots and interfere with the growth of the plant. These swellings differ from those formed by the nitrogen-fixing bacteria, which are small, about a quarter of an inch in diameter, and easily detached. Those formed by nematodes are frequently large and massed together, and cannot be detached without breaking the roots. Where nematodes occur—most frequently on sandy soils—the use of resistant varieties is called for.

Insect Pests.

At times the French Bean Fly—*Agromyza phaseoli*—attacks the cowpea in early growth, but damage therefrom, has, so far, not been serious.

The chief insect enemy is a bean weevil which lays its eggs in the pod of the cowpea in the field and also in the stored seed.

While prevention is not possible in the field, the attack of the insect after harvest may be frustrated by treating the seeding in the following manner:—

Exposure to a heat of 120 deg. to 130 deg. Fahr. for an hour or so will kill all insects as well as their eggs. In the warmer parts this heat can frequently be obtained from the sun if the seed is thinly spread on tarpaulins or sheets of iron. Artificial heating by means of hot flues can also be effected.

Fumigation with carbon bisulphide for twenty-four hours.—For treatment the seed should be placed in an air-tight container. In using the carbon bisulphide, 1 lb. is suggested for each 100 bushels of seed, and should be placed in saucers or shallow pans on top of the grain. As it volatilizes, the gas being heavier than air will sink through the grain. After twenty-four hours' contact the grain should be well aired to become free of the gas, which, if left longer, would interfere with germination, and then replaced in air-tight containers. Carbon bisulphide being highly inflammable, care in its use is imperative, no fire or flame being allowed nearby. At temperatures in excess of 60 deg. Fahr., it is most effective.

All stored seed should be thoroughly dry.

REFERENCES.

[1] Encyclopedia of Horticulture. Nicholson.

[2] The Queensland Flora. F. Manson Bailey.

[3] Piper, C. V. The wild prototype of the Cowpea. Circ. 124. United States Department of Agriculture.

[4] Morse, W. J. Farmers' Bulletin 1148. United States Department of Agriculture.

[5] Feeds and Feeding. Henry and Morrison.

TO SUBSCRIBERS—IMPORTANT.

Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the Journal to the subscribers concerned.

It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.

Dairy Produce Act Provisions Explained.

STABILISING THE INDUSTRY.

THE Dairy Produce Act, which was passed by the Commonwealth Parliament towards the close of last year, provides for the regulation of the transfer of butter and cheese from one State to another, and is on similar lines to the Dried Fruits Act, which was passed by the Commonwealth Parliament in 1928. Its main object is to ensure to all producers of butter and cheese a fair share—and not more than a fair share—of the advantages and disadvantages of selling within Australia and overseas, says an official statement issued at Canberra to-day.

Five years ago Australia exported 45,000 tons of butter overseas. During the year ended 30th June, 1934, this total had more than doubled and reached the high figure of nearly 109,000 tons, of which no less than 102,000 tons were sent to the United Kingdom. The value to Australia of this export trade last year was about £9,000,000.

Great Britain is the principal purchaser of our dairy products. Indeed, apart from a valuable market for some 6,000 tons in the East, the United Kingdom represents practically the only outlet for our exportable surplus, and year by year we have been sending greatly increased quantities to that market.

At the same time increasing quantities of New Zealand and Danish butters were being placed on the British market, and in these circumstances a fall in prices in the United Kingdom was inevitable, in order to bring about the necessary increase in consumption to absorb the greatly increased imports.

The Paterson Scheme.

Until recently a voluntary scheme was in operation known as the Paterson Plan, which was designed to assist in ensuring a more remunerative price for butter sold in Australia. Under this plan a levy was paid on all butter manufactured, and from the fund thus created a bounty was paid on all butter exported.

The existence of the bounty on exported butter brought about an automatic increase in the local price, and the dairying industry profited considerably from this enhanced price.

In view of its voluntary nature, it has been found difficult by the dairying industry to sustain the Paterson Plan. For some time there was an increasing tendency on the part of factories to break away from the scheme, and the industry claimed that another section of the butter-producing industry—the people who make butter on farms—were not making any contribution towards the stabilisation of the industry. These persons, together with the factories which had broken away from the plan, were reaping the full advantages and benefits of the improved conditions made possible by means of the Paterson Plan. In consequence of these circumstances and because of the large amount of butter being exported, the scheme rapidly lost its effectiveness.

The question of stabilising the industry by means of State and Federal legislation on the lines of the existing Dried Fruits legislation was first discussed at a Conference of Ministers for Agriculture held in

May, 1933, and in the following month the matter was further discussed at a conference of Premiers, at which the Commonwealth Government agreed that it would fully consider any proposal for the introduction of Commonwealth enabling legislation in the event of the adoption by the States of marketing measures in respect of butter.

The States of New South Wales, Victoria, Queensland, and Tasmania, which, in the aggregate, produce approximately 90 per cent. and 80 per cent. of the total output of butter and cheese respectively in Australia, have enacted legislation under which a Board has been established in each of those States to regulate the intra-State marketing of butter and cheese.

The Home Market.

One of the principal provisions in each of the State measures is that which empowers the respective State Ministers in conjunction with the proposed Boards to determine the quantities of butter and cheese which may be sold on the home market. The States, however, are not empowered to regulate the interstate transfer of goods without which it would not be possible to ensure that the balance of butter and cheese over and above that determined for home consumption shall be exported overseas. To meet this position, it was essential that there should be Commonwealth legislation which would prohibit interstate trade in butter and cheese except under license, which license will only be granted subject to the condition that the licensee shall comply with export quotas fixed by the Minister for Cmmerce. These export quotas are determined on the recommendation of prescribed authorities appointed by the Commonwealth. In those States where Boards are established under State legislation, the Boards act as Prescribed Authorities. The export quota determined in respect of butter manufactured during the months of May and June, 1934, was 55 per cent. and 50 per cent. for the month of July. The first export quota fixed for cheese was 25 per cent. for the month of July.

The system of export quotas prevents price-cutting on the Australian market, and assures that the producer will take his fair share of the less remunerative export markets—that is to say, the burden of export is equally shared.

Protection Against Gluts.

The system of control as is now applied to the dairying industry in relation to interstate trade does not necessarily involve any increase in the price to the Australian consumer over and above the additional cost previously brought about by the operation of the Paterson Plan. The Government believes it is necessary to the interests of the industry that those engaged in it should be protected by legislation against the possibility of glutted home markets and consequent adverse realisations.

The Federal Act was brought into operation by proclamation issued on the 2nd May, 1934, and it is provided in the Act that a poll of dairy producers throughout the Commonwealth shall be taken within six months after the commencement of the Act, to decide whether or not the legislation shall continue to operate. In this connection the Government considered that notwithstanding the assurances given by representatives of the industry to the effect that a majority of the producers were favourably disposed towards marketing legislation of this nature, it was desirable that the producers should be given the right to decide the matter for themselves.

The persons eligible to vote are those who, during the year ended 31st December, 1933, were producers of milk and either manufactured and sold at least 500 lb. of butter and/or cheese, or supplied to a factory sufficient milk or cream to produce at least 500 lb. of such produce. Where two or more partners produced the necessary quantity of milk or dairy produce from cows owned by them, each partner is eligible to claim enrolment, and in the case of farms worked on the share system the owner of the cows is regarded as the person entitled to claim enrolment. Each voter is entitled to one vote only, notwithstanding the number of farms in which he may have an interest.

The Closing Date.

The closing date for the poll is the 11th October, 1934.

There is in existence another organisation which is not controlled in any way by Commonwealth or State legislation. This organisation is known as the Commonwealth Dairy Produce Equalisation Committee Limited, which is registered under the New South Wales Companies Acts, with headquarters in Sydney.

The principal function of the committee is to secure to manufacturers of dairy produce, as far as reasonably practicable, equal rates of returns from sales made in Australia and overseas. In cases where manufacturers either over-sell or under-sell (on a quantity basis) on the Commonwealth market, an equalisation cash adjustment is made by the committee representing the difference between the Australian and overseas prices.

PLATE 189.—LARGE WHITE GRADE BACONERS AT MR. C. B. PETER BELL'S PIG FARM, MAROON, NEAR BOONAH.

This is a typical scene on Maroon, where approximately 1,000 pigs are raised each year under grazing conditions and fed entirely on maize and meat meal with lucerne and paspalum pasture.

Pampas Grass as Winter Cow Feed.

EXTRACTS FROM AN ARTICLE BY MR. B. C. ASTON, CHIEF CHEMIST, DEPARTMENT OF AGRICULTURE, NEW ZEALAND, IN THE NEW ZEALAND JOURNAL OF AGRICULTURE FOR 21ST MAY, 1934.

The Government Botanist, Mr. C. T. White, who has extracted this article, states that the correct name of the Pampas Grass, according to determinations received from the Royal Botanic Gardens, Kew (England). is Cortaderia Selloana, *though it is most frequently known to gardeners under the older name of* Gynerium argenteum. *Mr. White further states that it is quite common in gardens in many parts of Queensland, and the article by Mr. Aston seems to offer a use for the grass hitherto undreamt of. It is a tall-growing grass familiar to most people on account of its white, feathery plumes. A rather smaller kind with reddish plumes is sometimes seen. This is not a different species or variety as sometimes thought, but represents the male plant, the white being the female. Propagation of the plant is by seeds or divisions. It is not certain that the plant provides fertile seed in Queensland, but the general means of propagation is by division of the plants, a large clump giving a great number of roots suitable for planting out.*

The best time for planting out the grass is probably about September and October, or during the early summer rains, and about 1,000 plants would be required to plant an acre, the plants or roots being placed about 6 feet apart each way.

It might be mentioned that the grass when tested for the presence of a prussic-acid yielding glucoside has always given positive results for the presence of such a glucoside in Queensland-grown specimens, but if reasonable care is exercised in not letting cattle on to the grass on too empty a stomach, or allowing them to gorge themselves on it, little or no trouble should be experienced from it.—ED.

Mr. Aston writes: When dead or old leaves are prevented from accumulating by firing every year after cattle have eaten down the succulent green portions and some of the dead leaves, the subsequent growth is tender and easily grazed by cows.

One farmer, Mr. George Short, of Dargaville, writes that twenty-two years ago he had his first experience of pampas, and since then he has always grown it for shelter and stock food, for in winter all stock are fond of it, breaking down good fences to get at it. He has grown it on drain banks, in paddocks, and on hill land. It grows as well on poor gum land as it does on good swamp land. It would be a great asset to exposed farms near the coast where other shelter cannot thrive owing to salt winds. Mr. Short has not grown it for fodder alone, but knows its value as stock food. He sends photos of hedges he planted at Turiwiri, Northern Wairoa, one of the oldest of which is six years old and 10 feet high and shows signs of being well grazed as far as cattle can reach.

To Mr. Alec McClean, of Waitakaruru, Hauraki Plains, must, however, be given the great credit of being the first to profit adequately from his observations that cattle are inordinately fond of pampas in the autumn by systematically planting and using it as winter feed as described in the previous article. Since then Mr. McClean has extended

his plantations and has continued to use pampas systematically as winter food and has answered all inquiries which have come from both local and overseas farmers. He has willingly received and explained to deputations of agriculturists, chemists, veterinarians, pressmen, and other farmers his method. He has also supplied, at a nominal price, roots to those desiring to make experiments. Success has not come to Mr. McClean without perseverance in the face of many obstacles. Without knowing any of the previous opinions or work of others with pampas, and without any official guidance and advice, and, as he puts it, in the face of all sorts of discouragement and carping criticism which required quite a lot of determination to disregard, he has demonstrated beyond doubt that a new fodder plant is available which is destined, it is thought, to have very far-reaching effects in cheapening production in every branch of cattle farming.

The result of pampas-feeding on Mr. McClean's own cattle has been the subject of investigation by competent visitors who have expressed their appreciation of the condition of the stock on the farm. Although milking what is called "a very ordinary herd," mostly Jerseys, he is topping his district against all suppliers for amount of butter-fat per cow per month, which is shown by the factory returns, although many of his neighbours have wellbred stock with high butter-fat records. Mr. McClean's results are all the more remarkable as no top-dressing is done on his farm. The soil is not excessively moist in Ngatea, and in summer months it becomes decidedly dry. The soil is peaty, the subsoil being a rich clay. For further information of the Hauraki Plains soil see this "Journal," June, 1914.

Mr. McClean's method of laying out his plantations is simple and efficient. An area 1 or 2 chains wide and several chains in length is planted in the spring with pampas roots 6 feet apart, which provides approximately 1,000 plants to the acre. These are not fed-off until the second year, by which time the estimated yield of green material per plant is, roughly, 1 cwt., or 50 tons to the acre.

During the past winter Mr. McClean has fed 130 head of grown stock and 70 head of young stock on 2 acres of pampas with a run-off of 48 acres. Feeding-off was commenced on the 14th June, 1933, and finished on the 20th August, a period, approximately, of ten weeks. The method by which the cow with its soft mouth is able to demolish and graze these tall sedge-like growths varies with the individual. Some animals favour pulling the canes from the base while others take hold of the leaves almost at the tips. Either method appears to be equally easy to stock and causes them no inconvenience whatever.

Perhaps the feeding of pampas may be extended to cover supplementary requirements of early spring when stock tend to scour—for which it is an antidote—and late summer when the pasture tends to be overloaded with clovers and therefore requires balancing with a diet less rich in protein and still palatable, which pampas certainly is. The feeding of excess of protein is wasteful and, some authorities hold, injurious (see this "Journal," February, 1929, p. 97).

Mr. C. R. Taylor in going through the pumice country has taken the opportunity of inspecting shelter-belts of pampas, and finds them regularly grazed every winter by stock leaving good pasture to do so. He concludes that pampas has an economic value hitherto undreamed of and a definite place in every farm in the future.

By H. W. BALL, Assistant Experimentalist.

LAST July rains throughout the chief farming areas were of considerable benefit to all primary producers. Early wheat crops are now well established, and in many instances could not look better. The July falls, together with the storm rains received on 10th August, assured a successful winter season and came at a most opportune time to permit the planting of potatoes and onions below the Range, and also greatly assisted the working of land for all spring crops. The Central-west and South-western districts also benefited considerably, so that pastoralists in those areas are now assured of a good spring.

Maize.

Large areas are being prepared for the sowing of early maize as conditions are generally favourable for seeding operations. From a grain production point of view the early maize crop is always a risky one, but if seasonal conditions warrant it can always be profitably utilised as fodder or silage, and is therefore never a complete loss. This Department's stocks of Funk's 90 Day, Golden Beauty, and Star Leaming pure seed maize are now exhausted, but supplies of Reid's Yellow Dent and Improved Yellow Dent are still on hand.

Wheat.

Prospects for the 1934-35 crop are now greatly improved. Late sown areas have responded well to the favourable conditions, so that given average rains during September and October an excellent yield is

indicated. Chiefly owing to drought conditions in the United States of America and Canada, wheat prices have developed an upward trend and are now higher than at any time since August, 1930. There is every indication that the improvement will hold, as under-average crops are forecasted in many exporting and consuming countries, thus diminishing further the accumulated world surplus and paving the way for an improved basis of future trading. The Queensland Wheat Board does not consider that a Commonwealth Pool would be in the best interests of growers in this State, but that greater material advantage would be

Plate 190.—A Crop of "Currawa" Wheat, Darling Downs.

"Mountain or river or shining star,
There's never a sight can beat—
Away to the skyline stretching far—
A sea of the ripening wheat."

obtained by the establishment of State Pools to deal with local consumption and co-operating as far as possible in the stabilisation of prices from year to year, leaving the matter of export to be dealt with by a Commonwealth body. Cheques covering the payment of the first advance of the wheat bounty granted by the Federal Government are now being posted to growers, payment being made on the acreage basis.

Peanuts.

Queensland's second largest peanut crop has recently been harvested, over 3,000 tons being delivered to the silos. This quantity should easily meet Australian requirements. Growers are naturally disappointed at the statement recently issued by the Tariff Board, that no increase in the general tariff rates on peanuts could be granted, as they consider the present duty inadequate to protect the industry from the importations of nuts in shell, and of the lower-grade nuts used for oil extraction. There is no doubt that Queensland is now producing a high-grade nut suitable for both household and manufacturing purposes. Peanut cultivation is now centred in the South Burnett, but is increasing in the Central and Northern districts.

PLATE 191.—ANOTHER CROP OF "CURRAWA" WHEAT AT KINKORA.

". . . with a feelin' like content,
An' I feel like thankin' Heaven for a day in labour spent."

Tobacco.

"*The Tobacco Industry Protection Act of* 1933" came into operation as from 12th July last. This Act provides for the registration of tobacco growers, sellers of tobacco seed and seedlings, and for the destruction of old plants subsequent to harvest. Tobacco districts and pure seed areas are also defined. The chief object is to secure greater

PLATE 192.—A FIELD OF "FLORENCE" WHEAT, DARLING DOWNS.

"And the breeze sweeps o'er the rippling rows,
Where the quail and skylark nest."

control over the pests and diseases that are the chief factors in retarding the progress of this promising new industry. Registration forms are being prepared and will be posted to all growers as soon as possible. Northern sales, held late in July, disposed of 54 tons of leaf, some of which was 1933 stock. The average price received was 2s. 6d. per lb., several parcels bringing 4s. At Dalgety's sale, held in Brisbane on 16th August, 86 tons were offered, representing the principal tobacco-growing areas in the North, namely, Dimbulah, Mareeba, Woodstock, Charters Towers, Bowen, Koumala, Miriam Vale, Sarina, and also the south-western districts of Texas, Yelarbon, and Inglewood. As the offerings comprised a larger proportion of medium and inferior grades than in previous sales the average prices realised were lower. The top price, 4s. per lb., was paid for attractive lines from Dimbulah, Bowen, and Charters Towers.

Dairying.

All dairymen are advised to get on the roll and vote "Yes" in the forthcoming ballot under the Commonwealth Dairy Produce Act for the Dairy Produce Equalisation Plan. Owing to increasing production and the uncertain overseas markets, it is generally considered that without such a plan in operation butter prices in Australia will reach a lower level than ever before, probably falling to London parity, which would be disastrous for the producers.

WARTS—A COMMON UDDER TROUBLE.

Warts, which are really small tumours, occur frequently on the udder and teats of the cow. They are seen more often in young than in old cattle. There is some evidence to indicate that they may be infectious. When numerous, they make the process of milking difficult, and as a result of the friction, particularly in stripping, they may result in sore teats. Warts are of different shapes, some are rather long and have a distinct neck, others are flattened, whilst others again are cylindrical in shape. Sometimes they will disappear spontaneously, but usually treatment is necessary.

Treatment is preferably carried out when the cow is dry. Actual removal by surgical methods provides the best means of treatment. Where warts are flattened and extensive, the operation should be carried out by a veterinary surgeon, but where they are of such a nature as to be easily snipped off with scissors, this can be done by the farmer himself. After washing the teat to remove all dirt, it should be immersed in a vessel containing weak disinfectant for some minutes, before the operation is carried out. Bleeding is usually slight and may be controlled by the application of "white lotion," made up of ¾ oz. sulphate of zinc, 1 oz. acetate of lead, and 1 pint boiled water. A white deposit will form in the bottle when it is allowed to stand. The bottle should be well shaken before the liquid is used. For safety the bottle should be labelled "Poison."

The application of various medicaments will frequently remove warts without recourse to surgical means. For this purpose castor oil applied several times daily, caustic solutions, and acids have been used with success. When strong caustics or acids are employed a ring of vaseline should be placed round the wart so that the material applied will not spread and scald the surrounding skin. Treatment of warts by the application of the preparations mentioned requires preseverance, since removal in this way is slow.

AGRICULTURE ON THE AIR.

Radio Lectures on Rural Subjects.

Arrangements have been completed with the Australian Broadcasting Commission for the regular delivery of further radio lectures from Station 4QG, Brisbane, by officers of the Department of Agriculture and Stock.

On Tuesdays and Thursdays of each week, as from the 4th September, 1934, a fifteen minutes' talk, commencing at 7.15 p.m., will be given on subjects of especial interest to farmers.

Following is the list of lectures for September, October, November, and December, 1934:—

SCHEDULE OF LECTURES.

BY OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK, RADIO STATION 4QG, BRISBANE (AUSTRALIAN BROADCASTING COMMISSION).

Tuesday, 4th September, 1934—"Seasonal Farm Crops," Part I. By C. J. McKeon, Instructor in Agriculture.

Thursday, 6th September, 1934—"Seasonal Farm Crops," Part II. By C. J. McKeon, Instructor in Agriculture.

Tuesday, 11th September, 1934—"Seasonal Farm Crops," Part III. By C. J. McKeon, Instructor in Agriculture.

Thursday, 13th September, 1934—"The Tobacco Industry Protection Act of 1933." By H. S. Hunter.

Tuesday, 18th September, 1934—"Some Requirements of Plant Growth." By E. H. Gurney, Agricultural Chemist.

Thursday, 20th September, 1934—"Fertilizers and Manures." By E. H. Gurney, Agricultural Chemist.

Tuesday, 25th September, 1934—"Nutritive Value of Pasture." By E. H. Gurney, Agricultural Chemist.

Thursday, 27th September, 1934—"Mineral Ingredients in Stock Foods." By E. H. Gurney, Agricultural Chemist.

Tuesday, 2nd October, 1934—"Mammitis, a Disease of Dairy Cows." By K. S. McIntosh, H.D.A., B.V.Sc., Government Veterinary Surgeon.

Thursday, 4th October, 1934—"Worms in Pigs." By F. H. S. Roberts, M.V.Sc., Entomologist.

Tuesday, 9th October, 1934—"Feeding the Growing Pig." By L. A. Downey, Instructor in Pig Raising.

Thursday, 11th October, 1934—"Housing and Management of Pigs." By L. A. Downey, Instructor in Pig Raising.

Tuesday, 16th October, 1934—"Insecticides," Part I. By R. Veitch, B.Sc., F.R.E.S., Chief Entomologist.

Thursday, 18th October, 1934—"Insecticides," Part II. By R. Veitch, B.Sc., F.R.E.S., Chief Entomologist.

Tuesday, 23rd October, 1934—"Insecticides," Part III. By R. Veitch, B.Sc., F.R.E.S., Chief Entomologist.

Thursday, 25th October, 1934—"Insect Pests of Ornamental Trees." By A. Brimblecombe, Assistant to Entomologist.

Tuesday, 30th October, 1934—"Worms in Poultry." By F. H. S. Roberts, M.V.Sc., Entomologist.

Thursday, 1st November, 1934—"Black Spot of Citrus." By L. F. Mandelson, B.Sc. Agr., Assistant Plant Pathologist.

Tuesday, 6th November, 1934—"Marketing Pigs," Part I. By E. J. Shelton, H.D.A., Senior Instructor in Pig Raising.

Thursday, 8th November, 1934—"Marketing Pigs," Part II. By E. J. Shelton, H.D.A., Senior Instructor in Pig Raising.

Tuesday, 13th November, 1934—"Red Scale of Citrus." By W. A. T. Summerville, M.Sc., Assistant Entomologist.

Thursday, 15th November, 1934—"Care and Management of Growing Poultry Stock." By P. Rumball, Poultry Expert.

Tuesday, 20th November, 1934—"Dairy Problems No. 1." By F. J. Watson, Dairy Instructor.

Thursday, 22nd November, 1934—"Dairy Cattle Breeding." By C. F. McGrath, Supervisor of Dairying.

Tuesday, 27th November, 1934—"Butter Defects." By G. H. E. Heers, Senior Grading Inspector.

Thursday, 29th November, 1934—"The Care of the Foot of Domestic Animals." By J. A. Rudd, L.V.Sc., Director, Animal Health Station, Yeerongpilly.

Tuesday, 4th December, 1934—"Mineral Deficiency—a Common Disease of Farm Animals." By K. S. McIntosh, H.D.A., B.V.Sc., Government Veterinary Surgeon.

Thursday, 6th December, 1934—"Strangles in Horses." By J. A. Rudd, L.V.Sc., Director, Animal Health Station, Yeerongpilly.

Tuesday, 11th December, 1934—"Pineapple Fruit Rots." By H. K. Lewcock, M.Sc., Assistant Plant Pathologist.

Thursday, 13th December, 1934—"Dairy Problems No. 2." By F. J. Watson, Dairy Instructor.

Tuesday, 18th December, 1934—"Herd Recording." By L. Andersen, Senior Herd Tester.

Thursday, 20th December, 1934—"Dairy Problems No. 3." By F. J. Watson, Dairy Instructor.

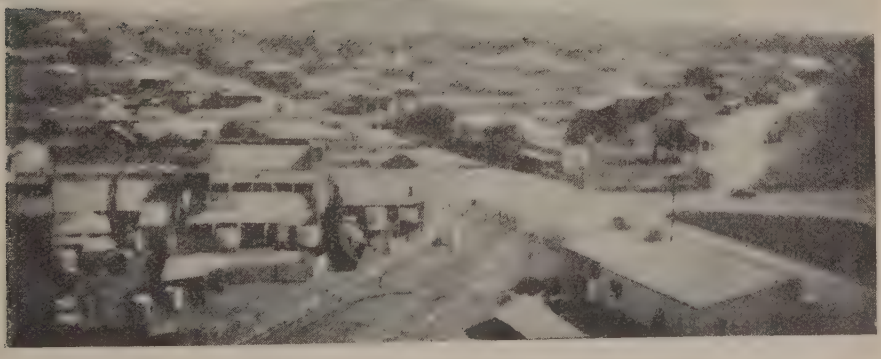


Plate 193.—Kingaroy from the top of the Peanut Silo, looking north of west.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, and the Guernsey Cattle Society, production charts for which were compiled for the month of July, 1934 (273 days period unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
MATURE COW (OVER 5 YEARS), STANDARD 350 LB.				
Kilbirnie Ethel 3rd (365 days)	Macfarlane Brothers, Radford	18,108·4	829·29	Mowbray of Barbalara
Mabel of Sunnyview	J. Phillips, Wondai	13,564·3	526·772	Diamond of Greyleigh
Favourite 6th of Oakvilla	W. Marquardt, Wondai	13,082·38	518·709	Victory of Greyleigh
Nita 8th of the Cedars	W. J. Barnes, Cedar Grove	12,748·16	492·161	Red Knight of Greyleigh
French View Lady May	S. H. Teese, Veresdale	11,642·1	456·889	Chermside of Thornleigh
Westbrook Violet 8th	C. O'Sullivan, Greenmount	11,532·64	452·170	Sheik of Upton
Rhodesview Beauty 4th	W. Gierke and Sons, Helidon	11,459·27	436·240	Birdwood of Blacklands
Ruby 2nd of Glen Allyn	G. Short, Malanda	9,107·25	400·534	Woodrow of Eacham Vale
Princess 7th of Oakvilla	H. F. Marquardt, Wondai	10,469·22	391·325	Victory of Greyleigh
Rose II. of Wilga Vale	A. E. Vohland, Aubigny	9,982·25	390·835	Brilliant of Wilga Vale
Rosemount Jumper 2nd	A. J. Bryce, Maleny	10,075·4	383·756	Victor of Oceanview
Stately 2nd of Bri Bri	W. Middleton, Cambooya	7,880·25	377·624	Lord Brilliant of Bri Bri
Marcheta of Happy Valley	R. R. Radel, Coalstoun Lakes	8,918·3	377·118	Molly's Hero of Glenthorn
Lavender 8th of Quarnlea	Lehfeldt Brothers, Kalapa	10,039·31	373·369	Lord Nelson of Blacklands
Shamrock of Happy Valley	R. R. Radel, Coalstoun Lakes	8,393	358·296	Molly's Hero of Glenthorn
SENIOR, 4 YEARS (OVER 4½ YEARS) STANDARD 330 LB.				
Primrose 5th of Bri Bri	W. Middleton, Cambooya	8,017·5	386·924	Lord Brilliant of Bi Bri
Rosenthal Maggie 8th	A. Sandilands, Wildash	9,172	374·223	Sunrise 3rd of Rosenthal

Junior, 4 Years (under 4½ Years), Standard 310 lb.				
Penrhos Phyllis	A. Sandilands	8,382	344·367	Coral Brae Bonnie's Charmer
Senior, 3 Years (over 3½ Years), Standard 290 lb.				
Champion 12th of Oakvilla	H. Marquardt, Wondai	12,066·04	488·286	Victory of Greyleigh
Villa Maria Broady 5th	J. Buckley, Rose Hill	6,948·5	335·798	Villa Maria Sir Charles
Junior, 3 Years (under 3½ Years), Standard 270 lb.				
Oakvilla Princess 11th	H. F. Marquardt, Wondai	9,386·24	403·493	Gordon of Swanlea
Amiens' Emblem	B. Carter, Gleneagle	8,960·45	330·54	Empire of Springdale
Senior, 2 Years (over 2½ Years), Standard 250 lb.				
Robina of Sunnyview	J. Phillips, Wondai	11,114·92	424·851	Lovely's Commodore of Burradale
Milstream May	W. J. Barnes, Cedar Grove	6,542·21	283·206	Whittier of Thornleigh
Primrose 8th of Bri Bri	W. Middleton, Cambooya	5,969·75	275·677	Majestic of Bri Bri
Jean 10th of Quarnlea	Lehfeldt Brothers, Kalapa	6,574·42	274·418	Nugget's Lad of Hillview
Junior, 2 Years (under 2½ Years), Standard 230 lbs.				
Navillus Empress II. (272 days)	C. O'Sullivan, Greenmount	8,398·06	350·887	Midget's Sheik of Westbrook
Kingsdale Alice 27th	A. A. King, Mooloolah	7,318·35	316·382	Express of Burradale
Morden Nina 15th	R. Mears, Toogoolawah	6,990·95	306·482	Jupiter of Morden
Sunnyview Gem II.	W. L. Burnett, Brookfield	8,219·44	286·94	Lovely's Commodore of Burradale
Kyabram Daphne	A. H. Black, Kumbia	6,090·3	277·982	Ledger of Greyleigh
Royston Melba 3rd	T. G. O'Maara, Humphrey	7,050·15	272·297	Phœnix of Springdale
Colulu Phyllis	J. Bambling, Gunalda	6,053·3	257·193	Cooee of Bellwood
Sunnyview Nellie 6th	W. L. Burnett, Brookfield	5,819·28	253·418	Lovely's Commodore of Burradale
Navillus Model III.	C. O'Sullivan, Greenmount	6,594·51	252·077	Midget's Sheik of Westbrook
Worangg Frances III.	R. Ray, Yargullen	4,878·9	230·028	Rosenthal's Roseleaf's Dividend
JERSEY.				
Mature Cow (over 5 Years), Standard 350 lb.				
Golden Fairy of Burnleigh	Chas. Klaus, Mundubbera	6,845·5	378·29	Noisy Jim of Burnleigh
Glengarry Mabel 2nd	J. and R. Williams, Crawford	6,857·2	361·103	Mike's Viscount of Kelvinside
Silver Wattle of Burnleigh	Chas. Klaus, Mundubbera	6,815·5	356·237	Trinity Baron

Production Recording—*continued.*

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	SENIOR, 4 YEARS (OVER 4½ YEARS), STANDARD 330 LB.			
Countess of Fernlea	Kittle Brothers, Gleneagle	6,244·5	336·26	Brookland's Gilded
	SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.			
Greenstock Poppy	J. B. Keys, Gowrie Little Plains	8,842·11	417·186	Greenstock Commander
	JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.			
Goulburn of Fernlea	Kittle Brothers, Gleneagle	6,945·3	340·413	Norwood Noble Boy
Glenmah Lady Viola	F. A. Maher, Moggill	5,538·4	289·593	Glenmah Victor's King
	SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.			
Bellefaire Bonaparte's Bon Bellette	F. J. Cox, Imbil	6,112·35	379·988	Bonaparte of Rozel
G. N. Rozel 5th	Cox Brothers, Maleny	4,591·1	264·849	Retford Royal Atavist
	JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.			
White Rose of Hamilton	J. Witton, Raceview	5,988·98	375·075	Retford May's Victor
Eastland's Ginger Princess	T. Bourke, Dallarnil	4,328·9	279·405	Cornelius Prince of Rosedale
Glenmah Victor's Queen (270 days)	F. A. Maher, Indooroopilly	4,941·9	275·331	Retford Victor's Noble
Dassie of Billabong	J. Mollenhauer, Moffatdale	5,393·91	257·935	Premier of Calton
G. M. Foxglove 4th	Cox Brothers, Witta	4,141·7	252·491	Retford Royal Atavist
	GUERNSEY.			
	SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.			
Laureldale Rosette	W. A. Cooke, Maleny	6,639	320·141	Linwood Favour
	JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.			
Laureldale Honour	W. A. K. Cooke, Maleny	5,954·85	266·918	Linwood Favour

PLATE 194.—REPRESENTATIVE PIG BREEDERS.

A deputation representative of the Queensland Branch, Australian Stud Pig Breeders' Society, to the Minister for Agriculture and Stock, Brisbane, 10th August, 1934. The deputation discussed with Mr. Bulcock many matters of importance to breeders, and thanked him for his practical efforts to assist the industry. Front row, left to right.—E. J. Shelton, Miss M. Patten (Department of Agriculture and Stock), R. Turpin, Hon. Frank W. Bulcock, Mrs. A. Alford, Miss J. Handley. Back row.—Messrs. Manning (rep. H. B. Kerner), J. Barkle, Mat. Porter, J. Gamble (rep. G. W. Winch), P. V. Campbell (President), J. C. Henderson, G. Handley, A. F. Gray (N.S.W.), R. V. Hamilton, T. J. Collins (N.S.W.).

Answers to Correspondents.

BOTANY.

The Coconut.

M.A.J. (Tewantin)—

We have no pamphlet for distribution dealing with the planting, growth, and cultivation of the Coconut Palm and the processes of making copra. Coconuts should be planted in nursery beds and either put upright in the soil with the pointed end downwards and buried at least two-thirds in the ground, or they may be planted on their side, a portion of the nut being left above the surface of the soil. Germination generally takes place in from four to eight months, and when they are anything from 2 to 4 feet high the young palms can be transferred to their permanent positions.

Various methods of planting are employed on different plantations, but about 25 feet apart all round, allowing 70 to 80 plants to the acre, has been found satisfactory. Keeping down weed growth in plantations is rather difficult, but it is usual to grow a cover crop, generally of some legume. The cover crop is usually of a creeping nature, such as the Black Mauritius Bean or similar plant.

The nuts for copra making are either sun-dried or kiln-dried, but as most of the nuts are grown in countries with a heavy rainfall and very humid conditions, oven-drying or kiln-drying is generally resorted to.

You are rather far south for the successful cultivation of coconuts for commercial purposes, and owing to the present very low price of copra and the enormous supplies available, it is not considered that the establishment of fresh plantations, even under the most favourable conditions, is warranted at the present time.

Curly Mitchell Grass. "Tar Vine."

R.D.L. (Nelia)—

The specimen of Mitchell Grass represents *Astrebla lappacea*, the Curly Mitchell Grass. This is the commonest species in Queensland, and, generally speaking, we think, can be regarded as the best. It retains a certain amount of food value even when dried. Regarding a lick to supply deficiencies, the Agricultural Chemist has made several analyses of this grass at different times of the year, and he will reply to you direct regarding a lick to supply the deficiency in the pasture, particularly the winter pasture.

The vine sent under the name of Tar Vine is *Boerhaavia diffusa*. This vine is widely spread throughout Queensland and the Northern Territory, and is regarded as being of high fodder value. Your notes on it were appreciated.

Grasses of the Gladstone District.

G.S. (Gladstone)—

There are probably about 100 native grasses in the Gladstone district. These include different sorts of Panic Grasses, Star Grasses, Love Grasses, Spear Grasses, and others.

The usual practice with the Grass and Fodder Clubs of State Schools is for the members to collect small samples and forward them for identification and report. We would advise you to follow this course during the coming season. Of grasses a few seed heads should be sent, and where possible one stalk should be pulled up from the roots and doubled backwards and forward so that it can roll comfortably into a piece of newspaper.

Where more than one specimen is sent, each should be numbered and a duplicate retained, when names corresponding to numbers will be returned. Of weeds, fodder plants, &c., a shoot a few inches long bearing either flowers or seed pods should be sent. It can either be forwarded fresh or can be pressed flat between sheets of ordinary newspaper for a few days or until it is quite dry before sending.

Mossman River Grass.

K.C. (Cairns)—

The specimen is *Cenchrus echinatus*, a burr grass that is a native of Tropical America, but now found as a weed in most tropical and subtropical countries. It is quite common in Northern Queensland and is sometimes known as the Mossman River Grass. Stock will eat it to about the same extent as they will the Bunch Spear Grass, and consequently it has some value, although it is very objectionable on account of the wealth of burrs it sheds, and where it will grow we should think better grasses could be planted.

Frangipanni.

W.E.K. (Chillagoe)—

Although Frangipanni is an extremely common plant in Queensland gardens, we have no record of it causing severe pain and temporary blindness if the sap gets into the eyes, like that of Mistletoe Tree and Poinsettia. In most of these plants with a milky sap, however, the sap has a blistering effect, and we should say that if the Frangipanni sap did get into the eye it would cause pain and blindness perhaps for anything from an hour or two to a couple of days. Although the Frangipanni is widely cultivated in tropical countries we can find no reference in literature, either in India or elsewhere, to the sap having caused blindness in human beings or stock. The only reference we can find to the sap is that in Bengal it is used as a purgative. Personally, if ordinary precautions are observed, we can see no objection to cultivating the tree.

Weir Vine.

L.G.W. (Roma)—

As you suggest the Weir Vine is a native of Queensland. Its botanical name is *Ipomaea Calobra*, the specific name being taken from the common aboriginal one for the plant in parts of the West. The vine is very closely allied to the sweet potato, and several white residents have told us that they have used the underground tubers as a substitute for yams or potatoes and found them moderately good eating. Others have informed us that they have chewed portions of the underground tubers to allay thirst.

The poisonous principle is unknown, but apparently resides in the green parts of the plant and if anything seems most abundant in the green seed pods. The isolation and identification of these rather vague poisonous bodies in plants by ordinary chemical analysis is a very difficult matter.

Emu Grass. Blue Panic.

W.G. (Dalby)—

The specimen represents *Psoralea tenax*, sometimes known as Emu Grass and sometimes as Native Lucerne, although this latter vernacular is applied to a number of leguminous plants in Queensland. It is an extremely valuable fodder plant, and worthy of every encouragement where it is growing. Sometimes stock do not take to it very readily, but once they get a liking for it they eat it freely and the plant is very nutritious.

Regarding Blue Panic, we think you would be well advised to try a plot of this grass in your district. We are rather inclined to regard Blue Panic in your district as suitable more particularly for small paddocks, say 3 to 5 acres, for periodical feeding off.

Ellangowan Poison Bush.

J.K.G. (Clifton)—

The specimen is, as you said, the Ellangowan Poison Bush (*Myoporum deserti*), a shrub widely distributed in Queensland and one long suspected of poisoning stock. Feeding experiments recently carried out confirmed the popular belief. Acute constipation and intense inflammation of the digestive tract are features of Myoporum poisoning. Most of the trouble experienced in Queensland has been from travelling stock.

General Notes.

Staff Changes and Appointments.

Mr. L. Moriarty, Inspector of Dairies, Clifton, has been appointed also an Inspector under the Slaughtering Act.

Mr. D. L. McBryde, of Tully Sugar Mill, Tully, has been appointed Assistant Technologist, Bureau of Sugar Experiment Stations, Department of Agriculture and Stock.

Mr. K. V. Henderson, Cotton Field Assistant, Monto, has been appointed Instructor in Cotton Culture.

Mr. F. H. Gilmore, South Johnstone, has been appointed Millowners' Representative on the South Johnstone Local Sugar Cane Prices Board in lieu of Mr. A. A. Moule, resigned.

Mr. H. Le Gay Holthouse has been appointed Assistant Cane Tester at the Invicta Sugar Mill as from 26th July, 1934.

Mr. P. A. Kelly, Inspector of Dairies, Oakey, has been appointed also an Inspector under the Diseases in Stock Acts.

Mr. R. Ferguson, Inspector of Stock, Beaudesert, has been appointed also an Inspector of Dairies.

Mr. W. A. Kearney, Inspector of Stock, Slaughtering, and Dairying, has been transferred from Cloncurry to Mount Isa.

Mr. R. E. Watson, Inspector under the Dairy, Stock, and Slaughtering Acts, has been transferred from Brisbane to Toowoomba.

Pineapples—Maturity and Colour Standards.

A regulation has been issued under the Fruit and Vegetable Act providing for Maturity and Colour Standards for pineapples. In future, matured pineapples shall be fully developed fruit, which, during the months of November to one side at the bottom grooved or relieved to the width and thickness of the lacing sugar content of not less than 12 per cent., and during April to October is quarter yellow coloured at the base and contains a total sugar content of not less than 10 per cent.

The Cheese Board.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts, extending the operations of the Cheese Board from 1st August, 1934, to 7th February, 1935, and extending the term of office of the present members of the Board for a similar period. The members of the Board are:—Messrs. H. T. Anderson (Biddeston), Chairman; T. Dare (Narko), A. J. Harvey (Pittsworth), D. G. O'Shea (Southbrook), A. Pearce (Coalstoun Lakes), and E. Graham (Director of Marketing). No petition was received on the question of the continuance or otherwise of the Board for the period in question.

Pentland a Pure Seed Tobacco District.

An Order in Council has been issued under the Tobacco Industry Protection Act, constituting a Pure Seed District for Tobacco at Pentland. Tobacco is not now grown commercially in this area, and it will be used for the raising of pure seed.

Primary Producers' Organisation and Marketing Acts—Signing of Official Documents.

Regulation No. 77A under the Primary Producers' Organisation and Marketing Acts provides that agreements and official documents connected with the business of a commodity board shall be signed by the Chairman or Deputy Chairman, and countersigned by the Secretary. Occasionally, difficulty has been experienced in obtaining the signature of the chairman or secretary to a paper, owing to the absence of either on leave or business out of the State, and to meet the position a new regulation has been issued to-day, which will provide that documents shall be signed by the chairman or deputy chairman, or in the absence of both by any two members of the Board, and countersigned by the secretary, or in his absence by a member (not being a member who has already signed).

City of Brisbane a Sanctuary under Animals and Bird Acts.

An Order in Council has been issued under the Animals and Birds Acts declaring the City of Brisbane to be a sanctuary for the protection of native animals and birds. It will be an offence, in future, for any person to take or kill any animal or bird within the boundaries of the city of Brisbane.

Amendment of the Dairy Products Stabilisation Act.

An Order in Council, issued under the Dairy Products Stabilisation Act, further amends that Act in certain particulars. A "quota" is now defined to be the proportion of any dairy product manufactured during any stated period by a manufacturer within the State that such manufacturer is permitted to sell in the course of his intrastate trade or commerce in this State.

A "stated period" is defined to include a period of time mentioned in the Act or in any public notice by which a quota is promulgated.

It was previously provided that a quota would remain in force until it was succeeded by a subsequent quota. It is now provided that a quota will remain in force for the period provided for in the notice promulgating it.

It is further provided that the promulgation of a new quota shall not affect the legality of anything done under a previous quota.

It was also provided that no manufacturer should sell in excess of his quota. The amendment of the section relative to this sets out in fuller detail this restriction.

Further amendments provide for business done at Board meetings, and for the fixing of deputies.

Better Boar Subsidy Refund Scheme Terminated—New Scheme in Operation.

The Better Boar Subsidy Refund Scheme in operation over the period, August, 1933, to 30th June, 1934, attracted considerable attention throughout Queensland and resulted in a wide distribution of pedigreed boars in the Large and Middle White breeds, and in increased interest in the development of more extensive outlets for Queensland pork in the markets of the United Kingdom.

This scheme terminated on 30th June, 1934, and has been replaced by a scheme fostered by the Rural Assistance Board of the Agricultural Bank. Under this scheme the Board, acting in co-operation with the Agricultural Bank and Department of Agriculture and Stock, advances on loan 50 per cent. of the landed cost of boars, four months to two years of age, in the following breeds:—Large White, Middle White, Tamworth, and Berkshire.

Forms of application are now available and may be obtained by writing to the Department of Agriculture and Stock, Brisbane, or to the Agricultural Bank. The loan is repayable on easy terms over a period of two years, subject to satisfactory arrangements being completed on receipt of the application form properly completed and accompanied by a fee of 5s., payable to the Rural Assistance Board, Agricultural Bank, Brisbane.

Registration of Stallions.

The Minister for Agriculture and Stock (Mr. F. W. Bulcock), in referring to recently published press statements dealing with the registration of stallions, desires to make it clear that existing legislation definitely prescribes that all stallions three years of age and upwards are required to be produced for examination by the Stallion Board.

Annual certificates are issued to horses of three and four years of age passed as sound and of approved type, and life certificates are granted for approved, sound five-year old horses.

The proposed amendment of legislation would provide for the examination and life certification of sound and approved blood horses at five years of age. If a horse is intended to be used for service prior to that age, it would be necessary to have him produced for examination. The variation proposed will, in effect, exempt all horses in training and under the age of five years from examination under the Stallions Registration Acts, but it would be necessary to produce for examination at one or other of the advertised parades all blood horses of five years of age and upwards not already submitted for examination.

The Minister desires it to be definitely understood that any variation in existing legislation outlined above would not apply to draught stallions.

Barley Board.

Messrs. Edward Fitzgerald, of Felton, and Henry Kessler, Cambooya, have been re-elected unopposed for a further term of one year as from the 1st October next, as members of the Barley Board.

Rural Topics.

Calf-Rearing.

In the rearing of calves it is important that they be fed separately. The practice of feeding in tubs or troughs must be strongly condemned, because it allows the fast drinkers to get too much milk at the expense of the slower ones. It also tends to make young animals drink faster than they should, which gives rise to digestive troubles. Slow drinking should be encouraged, because it allows the milk to combine in proper proportions with the saliva and assures thorough digestion. Proof of this is shown by the fact that slow drinkers always grow best, provided, of course, that they are given their full ration of milk. Moreover, it is impossible to cleanse a trough thoroughly, and as a consequence it is a common cause of scours—more particularly when made of wood or a hollow log.

Money is well spent in the erection of proper yards and bails for calf feeding, much time and temper being saved thereby. Too often there is an entire lack of convenience for this important work which is carried out twice every day.

Nutrition and Wool Growth.

Uniformity and strength of wool fibre depend on adequate nutrition. Malnutrition of the sheep leads to improper function of the wool follicle so that only a slender weak wool fibre is produced. This fibre may be so weak that on the wool coming through the skin it immediately breaks. Thus, any sudden deprivation or lowered nutrition is reflected by a tenderness or actual break in the wool produced at that time. Continued lowered nutrition is accompanied by the production of wool which is finer than normal and tender. Lack of character is often the result of an impaired nutrition.

Thus in drought years wool is what is termed "hungry fine," and is often tender. Sheep which have had their nutrition lowered by attack by internal parasites similarly may produce a tender wool. It may even show a break, this coinciding with the period when the parasites were exerting their greatest effect. Similarly, ewes rearing lambs may show a tender fleece, whereas other ewes of the flock, but not rearing lambs, i.e., dry ewes, have a sound well-grown wool.

Breaks in the wool are also brought about by a sudden change in feed, as, for example, when poverty-stricken sheep are suddenly placed on good feed.

Pig Paddocks and Pastures.

That the pig is instinctively a clean animal and does not require any elaborate or expensive housing or attention is now very well known and appreciated by all who have made a success of the breeding, feeding, and management of this class of live stock.

It is essential to success in rearing pigs that the premises in which they are kept be clean, dry, and free from draughts, and that the pasture over which they graze be clean and well supplied with sufficient herbage of a succulent nature.

Pig houses should not be cramped low or dark and evil smelling, but should be well constructed, be high enough to enable a person to move about inside for purpose of cleansing and care of the stock, and be open to the sunlight to such an extent as to be warm and dry in winter time and cool and airy in the summer.

Portable shelter sheds are much to be preferred for paddock use, also portable feeding floors and troughs, for these enable the paddocks to be kept in good condition, and they eliminate risk of danger to pasture and crops. Careful handling and efficient management go hand in hand, and the successful pig raiser is the one who studies all these features and keeps himself up to date.

These points are emphasised in the pamphlet, "The Pig Farm," by L. A. Downey, Instructor in Pig Raising, now obtainable at the Department of Agriculture and Stock, Brisbane.

Dentition of the Pig.

As a general rule it is not customary in farmyard routine to depend upon inspection of the teeth in deciding upon the age of a pig, although the dentition test may be applied in case of valuable show animals with a fair measure of success. Full particulars in regard to dentition may be obtained by those interested upon application to the Department of Agriculture and Stock.

A full grown pig has twelve incisors or front teeth, six in the upper and six in the lower jaw, and two canine teeth in each jaw. There are also seven molars in each side of the upper and lower jaws, or a total of 44 permanent teeth in all.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

MORE MILK FOR THE CHILDREN.

WE pointed out last month how important it is that our children should take sufficient milk to maintain their health and to insure sturdy development. Every child under six should take one pint daily and every child over six at least half a pint. It would be an immense benefit to the State if our present consumption of milk were doubled. This would also encourage our dairy farmers, a very hard-working class of men (including also their women and I fear often their children), who, we are informed, are in many cases not earning a basic wage.

Excellent milk might be supplied by contract to the schools in Brisbane at a price which would enable every child to have half a pint of milk for a penny with his other school lunch. This would entail no cost to the State. There might even be a small surplus. The distribution of the milk could be performed by senior scholars under the supervision of a teacher. This would be a lesson in order, discipline, and cleanliness. The children as a whole would enjoy better health and be better scholars. The other day a Brisbane mother wrote to us. She says, "I have two young children and pay a shilling a week for 2½ pints. My children have a long walk to school and one, who is studying for the scholarship, has a huge bag of books to lump, so I am reluctant to add bottles of milk. Why are school children so penalised? Why 6d. for 1¼ pints to the school children." Under this scheme her children would receive 2½ pints for 5d., or 5 pints for 10d.

Value of Pasteurised Milk.

The milk would be pasteurised and delivered in bulk. For such milk of excellent quality the Diamantina Hospital pays a little less than 1½d. a pint. Raw milk has often been a vehicle for the spread of infectious diseases. This risk may be prevented either by boiling or by pasteurising. For fifty years and more Brisbane mothers have been in the habit of boiling their milk, and have thereby saved their children from tuberculosis and other diseases derived from cow or the milkers or those who handle the milk. For one thing, tuberculosis of the spine and hipjoint have been much less common here than in the Southern cities, where the milk is boiled only in the hottest months. Therefore it is strange that there should be any prejudice against pasteurised milk, which is just milk that has been heated about half way to boiling point and kept at that heat for about half an hour. Nothing but pasteurised milk is used in the Brisbane Baby Clinics. What is good enough for infants and invalids should be good enough for anybody.

Benefit of a Daily Ration of Milk.

Perhaps it is necessary to quote some authoritative statements. From a leading article in the "British Medical Journal" of 24th February, 1934, we extract the following sentences:—"There is every reason to believe that a daily ration of milk given to children, particularly to those who are living on the borderline of under-nourishment, is likely to exert a beneficial action on their mental and physical development. That a large amount of disease is carried by raw milk is no longer an opinion; it is a fact—a fact as well attested as any in the domain of medical science. There do not appear to be any grounds for the belief that pasteurised milk is a less valuable component of the diet than raw milk for children, who satisfy the bulk of their nutritive requirements from sources other than milk. And again there are strong grounds for the belief that infants can satisfy all their requirements on diets of adequate amounts of pasteurised milk provided that extra vitamin D and of course vitamin C are added to the diet." The last sentence simply means that these infants should take small quantities of a codliver oil emulsion and of orange juice. The Medical Research Council of Great Britain in their report for 1932-33 states that "efficient pasteurisation of milk remains an essential second line of defence in safeguarding human health. The council are not aware of any trustworthy evidence that pasteurisation, if properly carried out, has any seriously damaging effect upon the nutritive qualities of the milk."

The low cost at the Diamantina Hospital depends on the milk being supplied in bulk and not in bottles, for at least half of the retail cost of milk is due to the cost of distribution. It would not be possible to obtain milk at this price, we fear, in our smaller towns, but something should be done there also to supply school children with good and cheap milk. The conditions in these towns are dissimilar and would need special investigation in each case. For the pre-school child the problem is also difficult. Many mothers need to be taught that to give their children only condensed milk or powdered skimmed milk in large quantities of water is a mere pretence of proper nourishment. All children of families on rations should be supplied with milk as a matter of course. This should, we think, be done also in the case of young children of families receiving relief wages.

The Useful Goat.

In country districts conditions vary widely. In dairying districts there is plenty of milk, but some families do not drink it, and their children suffer in consequence. In sugar-growing and fruitgrowing districts every farmer could keep a cow, and have abundance of milk for his family, but many think it too much trouble. Again, there are the dry districts with frequent droughts. Here the health of the children depends mainly on goat's milk, which costs no money in good seasons. Perhaps because it costs nothing when natural feed is plentiful, the goats are allowed to go dry whenever it is scarce. Very few feed their goats, even when mulga can be obtained at no cost, but that of personal exertion. In all these country districts the only thing needed is better education of the mothers.

IN THE FARM KITCHEN.

DRIED FRUITS AND THEIR USES.

Sun-dried fruits were known in olden times, for it is recorded in history that King David of Israel accepted raisins in payment of taxes; and down through the ages we find evidence that sun-preserved fruits were always considered valuable foods.

For health reasons, fruits and vegetables should appear every day in the menu of both young and old. It is not, however, always possible to obtain fresh fruit, and although dried fruits should not altogether take the place of the fresh article, they form an acceptable change in the daily diet. Dried fruits are deficient in vitamin C, but they add so much to the diet in the way of fuel, minerals, laxative properties, and palatibility, that one can easily make up their vitamin deficiency by other foods such as oranges and various raw vegetables.

Cooking Dried Fruits.

The flavour of the fruit is retained when it is cooked by the following method, while much less sugar is required for sweetening if it is added towards the end of the cooking. A few grains of salt will bring out the flavour of stewed apples; the salt should be added towards the end of the cooking.

1. Wash the fruit thoroughly in several waters.
2. Soak overnight in fresh water.
3. Cover the saucepan, and cook slowly until the fruit is tender.
4. Add sugar, if necessary, five minutes before the fruit is cooked.

Some Favourite Recipes.

Steamed Ginger Fig Pudding (serves 8)—1 egg; 1 cup golden syrup; ½ cup melted fat; 1 cup minced figs; 1 cup hot water; 1 tablespoon ground ginger; 1 teaspoon bicarbonate of soda; 2½ cups sifted flour.

1. Beat eggs slightly, and add golden syrup and melted fat.
2. Add minced figs, and beat thoroughly.
3. Sift flour, ginger, and soda together.
4. Add this to the first mixture, alternately with 1 cup of hot water.
5. Beat thoroughly, and turn into a greased covered pudding mould.
6. Steam 3 hours, and serve with lemon sauce.

Lemon Sauce—1 egg; 1 cup sugar; one-third cup melted butter; 1 tablespoon flour; 1 teaspoon lemon extract.

1. Beat egg slightly in the top of a double boiler.
2. Add sugar, butter, and flour.
3. Beat until smooth, then add 1 cup boiling water and cook 5 minutes, stirring frequently.
4. Add lemon extract.
5. Serve hot over pudding.

Peach Coffee Cake—1 cup dried peaches; 2 cups sifted flour; ¼ cup sugar; 4 tablespoons butter; ¾ cup milk; 4 teaspoons baking-powder; ½ teaspoon salt; 2 teaspoons cinnamon; ½ cup yellow sugar; ¼ cup flour.

1. Wash peaches thoroughly, and cook until tender.
2. Remove the skins from peaches, and cut in strips ½ inch wide.
3. Sift 2 cups flour; ¼ cup sugar, baking-powder, and salt.
4. Work in butter with two knives until mixture resembles coarse meal.
5. Add milk gradually while stirring.
6. Beat well and put into a greased shallow pan.
7. Cover the top of the batter with the cut peaches.
8. Cover all with the following mixture:—Cream together 4 tablespoons butter, ½ cup yellow sugar, ¼ cup flour, and 2 teaspoons cinnamon.
9. Bake thirty minutes in a hot oven of 42 deg. F.
10. Serve with custard or any desired sauce.

Apricot Mousse (serves 6 to 8).—Two cups milk; 1 cup sugar; 2 tablespoons flour; 2 cups whipped cream; 2 egg-yolks; 1½ teaspoons gelatine; 1 cup cooked dried apricots.

1. Scald milk in a double boiler.
2. Mix sugar and flour thoroughly, and add to milk.
3. Pour mixture over two beaten egg-yolks, and return to double boiler to cook for two minutes or until mixture coats the spoon.
4. Soak gelatine in one tablespoon of cold water.
5. Add soaked gelatine to hot custard mixture.
6. When mixture is cold, add dried apricots which have been rubbed through a coarse wire sieve.
7. Add whipped cream and freeze.

If the pudding is not to be frozen, but simply set, use 1½ teaspoons of gelatine. —"South African Gardening and Country Life."

CORNISH PASTIES.

Materials.—For filling: ½ lb. topside steak or leg chops; ½ lb. potatoes; 1 small onion; 1 teaspoonful salt; ¼ teaspoonful pepper. For pastry: 6 oz. flour; 3 oz. dripping; ½ teaspoonful baking-powder; ½ gill water.

Utensils—Bowl; sieve; cup; board; rolling-pin; knife; basin, brush; baking tin.

Method—

1. Sift flour, baking-powder, and salt into a bowl.
2. Add dripping; rub it into the flour with the tips of the fingers.
3. Slowly add sufficient water to make dough; turn out on a floured board; knead lightly; cut into four pieces.
4. Roll out each piece into a circle.
5. Wash, peel, and cut potatoes into small cubes; cut meat up small; peel and chop up onion; mix these all well together, adding pepper and salt.
6. Divide into four portions; put one portion on each circle of pastry.
7. Wet half the edge of each circle; fold one-half of each circle over the meat on the other half; pinch the edges together, making a shell-like pattern by twisting the pastry slightly with the thumb and index finger.
8. Brush over with egg or milk; place on a flat tin in a hot part of the oven for 15 minutes; remove to a cooler part and bake for 30 minutes; serve hot.

PLUM PUDDING WITHOUT EGGS.

Materials—½ lb. flour; ¼ lb. suet; ¼ lb. sugar; ¼ lb. stoned raisins; ¼ lb. sultanas; 1 oz. candied peel; 1 teaspoonful mixed spice; ½ nutmeg; 1 teaspoonful carbonate of soda; 1 gill milk; ½ gill warm water.

Utensils—Bowl; sieve; knife; wooden spoon; teaspoon; cup; basin; greased paper or pudding cloth and string; steamer or large saucepan.

Method—

1. Sift flour and salt into a bowl; rub in finely-chopped suet.
2. Add sugar, stoned raisins, sultanas, chopped peel, spice, and nutmeg; mix well.
3. Add the soda dissolved in milk and water; stir until all the ingredients are thoroughly mixed.
4. (*a*) Pour into a well-greased basin; cover with greased paper; steam for 4 hours; or

   (*b*) Pour into the middle of a pudding cloth wrung out of boiling water and sprinkled with flour; tie up securely; put the pudding into a saucepan three parts full of boiling water; boil for 3½ hours.
5. Turn out on a hot dish; serve with boiled custard.

Note—For a date or fig pudding use cut-up dates or figs instead of sultanas, raisins, and candied peel, omit spice and nutmeg, and use ½ teaspoonful instead of 1 teaspoonful of carbonate of soda.

FRITTERS.

Materials—4 oz. flour; 1 dessertspoonful butter; white of 1 egg; 1 gill of warm water; dripping for frying; 8 small slices of cold cooked meat or fruit; 3 sprigs of parsley or 1 tablespoonful of sugar.

Utensils—Bowl; sieve; wooden spoon; small saucepan; basin; whisk; skewer; fish kettle or large saucepan; brown paper; dish.

Method—

1. Sift flour and salt into a bowl; make a well in the middle.
2. Pour in melted butter; add warm water slowly; stirring carefully until the flour, butter, and water are mixed into a batter.
3. Add the white of egg beaten to a stiff froth; stir gently.
4. Lift a slice of meat or fruit on a skewer; dip it into the batter; when completely covered drop it into deep hot smoking fat; repeat as often as necessary, watching those put into the fat first.
5. The fritters should float, and must be turned quickly when browned on the under side.
6. When golden brown all over lift them out on a skewer and drain them on paper.
7. Arrange piled up on a hot dish; if made with meat, garnish with parsley; if with fruit, sprinkle with sugar.

Notes—

1. Meat for fritters must be cooked, freed from fat and gristle, and cut into slices no thicker than ¼ inch.
2. Bananas must be cut into slices lengthways.
3. Apples must be peeled and cut into slices ⅜ inch thick across the core; the core must be cut out with a corer; the slices should be put into a shallow pan of boiling water and boiled for 3 minutes; a skewer should be used to turn the slices, and care must be taken not to break them.
4. Pineapples must be peeled and cut into slices ⅜ inch thick; the eyes and core must be carefully removed without breaking the slice; if the pineapple is very large the slices should be halved or quartered.

TRIPE AND ONIONS.

Materials—1 lb. tripe; 2 onions; 1 cup milk; 1 tablespoonful flour; salt and pepper; 1 dessertspoonful chopped parsley.

Utensils—Bowl; knife; 1 quart saucepan; 1 pint saucepan; colander or strainer; wooden spoon; basin; dish.

Method—

1. Wash the tripe in warm water; cut away the fat; cut tripe in small pieces.
2. Put the pieces into a saucepan; add enough cold water to cover tripe; put the saucepan on the fire.
3. Boil for 5 minutes; remove from fire; strain off water.
4. Peel and slice onions; put them into a saucepan; add enough cold water to cover them; bring to boiling point; strain off water.
5. Put the parboiled onions into the saucepan with the tripe; cover with cold water; boil till the tripe is tender; strain away half the water.
6. Add milk; bring to boiling point; thicken with flour blended with cold milk; boil for 5 minutes; season with salt and pepper.
7. Serve on a hot dish; sprinkle chopped parsley over the tripe before sending the dish to the table.

STEAK AND KIDNEY PUDDING.

Materials—For pastry: 6 oz. flour; 3 oz. suet; ½ teaspoonful baking-powder; ½ teaspoonful salt; ½ gill water. For filling: 1 lb. steak; 2 sheep's kidneys; 1 slice bacon; 1 tablespoonful flour; 1 teaspoonful salt; ¼ teaspoonful pepper; 1 teaspoonful chopped onion.

Utensils—Board; rolling-pin; bowl; sieve; knife; basin; cup; greased paper and steamer, or pudding cloth and string; large saucepan.

Method—

1. Sift flour, salt, and baking-powder into a bowl.
2. Rub in finely-chopped suet; work into a paste with water; turn out on a floured board; knead lightly.
3. Roll out to the thickness of ¼ inch; line a well-greased basin with part of the pastry.
4. Cut steak, kidneys, and bacon into small pieces; roll pieces in flour, pepper, and salt.
5. Put pieces in layers into the lined basin; sprinkle each layer with minced onion; pour in enough water to come up to 1 inch from the edge of the basin.
6. Cover with pastry; trim the edges with a sharp knife, cutting downwards; pinch the edges of the lining and covering pastry together.
7. (*a*) Cover the pudding with greased paper; steam it for 3 hours; or
   (*b*) Sprinkle with flour the middle of a pudding cloth wrung out of boiling water; tie the pudding cloth securely over the top of the pudding; put the pudding into a saucepan three parts full of boiling water; boil for 2½ hours.
8. Since the pudding cools quickly, it should be served in the basin in which it is cooked; a serviette should be pinned round the basin, and the basin placed on a dish before it is sent to the table.

LEMON MERINGUE.

Materials—½ pint milk; 1 cup bread crumbs; 2 eggs; 1 tablespoonful butter; 3 tablespoonfuls sugar; the grated rind and juice of 1 small lemon.

Utensils—Saucepan; basin; cup; plate; whisk; pie dish; grater; squeezer.

Method—

1. Put the milk into a saucepan; bring it to the boil; put bread crumbs into a basin.
2. Pour the boiling milk over the crumbs; add grated lemon rind, butter, and half the sugar; mix well; allow to cool.
3. Separate the yolks and whites of eggs; beat the yolks well; add them to the cooled mixture in the basin.
4. Pour the mixture into a well-greased pie dish; bake in a moderate oven until the pudding is set but not browned.
5. Whisk the white to a firm froth; add lemon juice and the remainder of the sugar, making a stiff meringue.
6. Pour the meringue over the pudding; return it to the oven till the meringue is set and slightly browned.

POTATO SCONES.

Materials—1 lb. boiled potatoes, sweet or English; 1 teaspoonful salt; 3 tablespoonfuls flour; ½ gill water.

Utensils—Board; rolling-pin; knife; cup; frying-pan or girdle.

Method—

1. Mash cold boiled potatoes; add salt and flour.
2. Mix well; add enough water to make the mixture into a dough.
3. Roll out to the thickness of ¼ inch; cut into squares or triangles.
4. Heat a girdle or frying-pan; sprinkle it with flour.
5. When the flour turns a creamy colour put the scones on the hot pan.
6. Cook for about 5 minutes; turn; cook the other side until it is slightly browned.

PRUNING OF TREES AND SHRUBS.

The following hints on the pruning of trees and shrubs were given by the Superintendent of the Botanic Gardens, Sydney, in the course of a paper read at the recent Central Coast conference of the Agricultural Bureau of New South Wales.

The object of pruning trees is to regulate the growth so that shapely specimens may develop. The first important matter in the pruning and training of young trees for specimens is to see that they are developed on a single straight stem or bole. This is done by seeing that the leading shoot is in no way injured, and is allowed to develop unhampered, by, if necessary, cutting away any side shoots that appear to be rivalling the main shoot for leadership. Where a clean bole is required for a certain height, the lower branches should be gradually cut away as the plant grows. Avoid cutting away too much at any one time, and try to do any cutting before the side branches are too large, because each cut makes a wound and the larger the wound the more likely, unless properly treated, that decay or disease will make its appearance. The top also may require a little thinning and shaping in the early stages to balance the tree.

In dealing with older trees where through accident or other cause it becomes necessary to remove some of the larger branches, the cut thus made, being a large one, should be properly treated at once, otherwise it becomes a settling place for parasitic diseases. When removing a large branch, do not attempt to cut it all away in one large piece, unless of course you have it slung; if you do you will probably find that its weight will tear away a portion you do not want injured and offer further harbour for parasites.

All limbs and large branches should be sawn off close to the trunk so that no stump, which will probably die back into the heart of the tree before the trouble is noticed, is left. If sawn off close to the trunk with a clean cut at about the level of the surrounding bark, the bark will eventually cover the wound, or at any rate form a callous around it and to a certain extent prevent decay.

Any cuts made should be treated immediately after being made with either gas or Stockholm tar or some such mixture, thus sealing the raw surface and protecting it from disease. This wound should be periodically treated if it shows signs of cracking or opening up.

Their pruning is one of the most important phases in the growing of shrubs. The art of pruning as applied to ornamental as well as flowering shrubs may be said to serve one or more of the following purposes—(1) To improve or alter the shape of the plant; (2) to increase the quantity or quality of the blossoms; or (3) to bring about an improvement in the health of the plant. Therefore its proper practice necessitates an intimate knowledge of the habits and nature of the subject to be operated on. For instance, a collection of flowering shrubs, in so far as they need pruning at all, cannot be pruned properly unless the workman knows the time of flowering of each one and other little peculiarities of growth.

Although the winter months are looked upon as the time for general pruning it must not be taken for granted that all shrubs can be pruned then. A very good rule with regard to all flowering shrubs is to prune at such a season as will allow of the fullest possible period of growth before the next flowering season comes around.

Those shrubs on which flowers are borne on the growth of the current year should be pruned in the winter before the growth commences. The previous year's wood may, if necessary, be cut hard back to make the plant more shapely. Then there are those that flower on the previous season's growth. These should not be cut back until immediately after flowering, which takes place in the spring or early summer months.

A few points to remember when pruning, assuming one knows the habits of the plants, are as follows:—Cut out all weak and spindly growth, and shorten back growths where necessary, but not in a formal fashion by just clipping the plant all around. Show as few cuts as possible and leave the plant in as natural shape as you can. Many of our deciduous shrubs and a few of the evergreens will stand cutting right back to the ground if circumstances demand such drastic action.

THE GARDEN COMPOST HEAP.

The garden compost heap is a cheap means of converting garden and household vegetable refuse into valuable fertilizing material. Materials such as lawn clippings, spent crops free of disease, vegetable tops, &c., should all be used in this manner, but the coarse, woody stalks of strong-growing plants should not be used.

The production of artificial manure from garden waste, straw, &c., consists in the decomposition, by fungi and bacteria, of much of the plant material. The nitrogen in the process is converted from an inorganic to an organic form, and is

present in increased amount in the material finally produced. The rapidity with which the process goes on is influenced by the type of material, its degree of maturity and chemical composition, and by the presence of nutrients such as lime, phosphate, nitrogen, and potash, for the organisms carrying on the decomposition are much akin to plants in their requirements.

Actual damage can be done to crops, other than some legumes, by the addition of uncomposted, poor-quality material to the soil. This damage is due largely to a lack of available nitrogen in the soil. Such poor-quality materials as bush scrapings, dry mature grass or straw, offer a good source of energy for the soil bacteria and fungi, which rapidly increase in numbers, and in so doing consume all the available nitrogen. This competition for soil nitrates results in the nitrogen starvation of crop plants.

The usual process of allowing plant refuse to decay without any chemical treatment results in a very acid product, providing no immediately available nitrogen. With nitrogen-poor plant residues it becomes necessary to add available nitrogen to the heap, as well as lime, which prevents the development of acidity, and prosphate, which is required in the nutrition of the organisms. With nitrogen and mineral-rich materials such as legumes (peas, beans, &c.), green vegetable tops, and other green succulent material, the use of lime alone should be sufficient to enable rapid decomposition.

With general refuse or poor-quality material, a heap can be made on a square base, and of such size that the final height is about 3 feet. Spread the chopped-up material in layers several inches deep, treating each layer in the following manner:—

Snow over with ground limestone (5 lb. per 100 lb. material), fork in loosely, give a sprinkling of superphosphate, and then add sulphate of ammonia at the rate of 1½ lb. per 100 lb. material. The material should be moistened before building up the layers, if not already moist. Ammonia may be given off slowly, so that it is necessary to keep building up and treating the successive layers quickly, so that it will not be lost. The final layer is not treated, and may be given a covering of an inch of soil. When next the heap is added to, the untreated layer can be moistened and treated.

When the heap is at the full height, after subsidence due to compaction and loss of material by bacterial action, the heap can ferment under the untreated capping, which can be used as a base for the next heap. The heap should be kept damp, but water should not be added in quantity sufficient to cause drainage from the heap.

In summer the material should be ready for use after two months, but in cold weather the process is much slower.

Artificial manure properly prepared is very similar in chemical composition to composted horse manure, and gives equally good results in promoting plant growth.

FERTILITY OF THE HOME GARDEN.

Intensive gardening demands a higher degree of soil fertility than does ordinary field crop culture. An efficient system of soil management should not only make allowance for the present crop, but should aim at an ever-increasing reserve of fertility. It should determine the necessity and value for the particular soil of organic matter, how most economically to apply this material, then attempt to supplement this where necessary, by liming and the addition of artificial fertilizers.

Organic matter has an important function in the growth of plants as a source of carbon dioxide, in improving the physical condition of the soil, in increasing the water-holding capacity, allowing root penetration, and modifying extremes of soil temperature. In addition to providing some of the mineral constituents required in greatest amount, organic matter provides certain rare and little understood elements, usually not considered in the preparation of artificial fertilizers. Heavy soils in which the fine particles accumulate in large masses, and crack badly on drying, can only be improved in texture by liming when acid, and the addition of organic matter to prevent the clods from cementing.

In general, the richer the food of animals in fertilizing substances the richer their excreta, particularly the liquid portion. This contains most of the potash and a great deal of the nitrogen, but only a small amount of the phosphate which passes through their bodies; further, it contains these substances in a form

ready for the immediate use of the plant. It is therefore important to realise that unless precautions have been taken to include it with the solid excreta, most of the valuable fertilizing constituents have been lost.

The kind of animal affects the fertilizing value of manure. Horse manure is richer and more readily decomposed than cow manure, since the mineral requirements of the milking cow are much greater than those of the horse. Poultry manure, when fresh, is a rich fertilizer compared with horse or cow manure; it contains more than twice as much nitrogen and phosphate, but has only about the same amount of potash. The bulk of its nitrogen is present in an easily available form, hence it is a quick-acting or forcing nitrogenous manure.

Animal manure as commonly procurable has not been carefully conserved against the loss of fertilizing constituents, and unless the liquid portion has been included, a considerable portion of the nitrogen present is not of use to plants. It must be regarded as an unbalanced fertilizer, and the fertilizer balance can be greatly improved by the separate use of superphosphate, and sulphate or chloride of potash.

Where the organic matter of the soil is maintained by using manure, a degree of fertility will be maintained, but an annual application of 100 to 150 lb. per 100 square feet will be necessary.

LIME FOR THE GARDEN.

Lime fulfils many functions which are essential to soil fertility. Its most useful action is in neutralising the acidity of strongly acid soils, for with the removal of acidity the other valuable effects of liming follow. Lime improves the physical condition of heavy acid soils, ensuring better drainage and aeration, and making cultivation easier, and is an essential plant nutrient, and when present in sufficient amount promotes many phases of bacterial activity, especially those ultimately bringing the reserves of nitrogenous material in the soil into the soluble forms of nitrogen which plants utilise.

There is no foundation for the common statement that exposure of acid soil to sun and air "sweetens" or reduces its acidity. Acidity is developed through an insufficiency of lime in the original soil-forming material, or by the loss of lime, through leaching, and absorption by plants. Acidity thus developed can only be counteracted in field or garden practice by the use of some form of lime. The forms of lime used for counteracting soil acidity are hydrated or slaked lime, and ground limestone or carbonate of lime.

Slaked lime is formed by the action of water on burnt or stone lime, and forms a very fine powder which can be efficiently spread. Ground limestone is a cheaper and more pleasant material to handle than slaked lime, and can nearly always be relied on to give as quick and good results as slaked lime, provided the material is sufficiently fine and well distributed, and that equivalent dressings are applied. In the last respect, 4 lb. of carbonate of lime are required to supply as much "effective" lime as 3 lb. of slaked lime contains.

The soil to be limed should be dug over and reduced to good tilth, the lime uniformly spread, and then lightly worked into the top several inches of soil. The amount of lime to be used depends on the degree of acidity of the soil, its texture, organic matter content, and the type of plant to be grown. Unless all these features can be determined, suggestions on the amount of lime that it is necessary to add to a soil can only be approximate.

On loams and heavier soils, dressings may range from 1 lb. of slaked lime, or 1½ lb. ground limestone, per square yard on loams, to double these quantities on clay loams and clays. Sandy loams or still more sandy soils can receive lighter dressings of approximately half the amount for loams. Lime is lost most rapidly from sandy soils, which are usually more acid than heavier soils under the same conditions. Under garden conditions, with frequent waterings, lime is continually being lost, especially from the sandier types of soil. After the initial liming, which may need to be heavy to counteract strong acidity, it is preferable to add light dressings each season, rather than occasional heavy dressings.

It is not always necessary to add sufficient lime to completely neutralise soil acidity, as most garden plants grow well on slightly acid soils. This slightly acid condition will only result in the majority of garden soils after liming. Only

for those plants listed below as very sensitive to acidity is it advisable to completely neutralise acidity. Whilst many plants grow best on neutral soils or on slightly alkaline (opposite of acid) soils, a considerable number of plants will tolerate fairly acid soils. The latter are not adversely affected by being grown in limed soils, though many plants which require a good lime supply may fail on acid soils.

By careful planning of the garden cropping scheme, portion of the area may be set apart and only lightly limed, if at all, for certain plants (as indicated below), and the remainder limed for those crops with a higher lime requirement. Potatoes, which will grow on acid soils, do best on slightly acid soils, and in gardens where dry conditions are not experienced the danger from scab diseases in slightly acid soils is small.

The following statement shows the relative sensitiveness of a number of garden and crop plants to acid soil conditions:—

Very Tolerant.—Parsley, potato, radish, strawberry, sweet potato, tomato, cow-pea, maize, millet, oats, rye.

Tolerant.—Bean, Brussels sprouts, carrot, choko, cucumber, endive, khol rabi, pea, pumpkin, rhubarb, squash, turnip, watermelon, crimson clover, vetch.

Sensitive.—Broccoli, cabbage, cauliflower, eggplant, sweet corn, barley, rape, red clover, sweet clover, wheat, white clover.

Very Sensitive.—Asparagus, beet, celery, lettuce, onion, parsnip, spinach, lucerne.

Evidence is available to show that excess of lime under certain conditions may depress plant growth. Overliming may result when the calculated amount of lime is applied to the surface zones of soil, and not worked to the proper depth. Over-liming injury is produced only on heavily-limed acid soils, and not on non-acid soils, or soils which have previously been limed. This injury is not permanent and is usually overcome by the time the first crop is removed. Lettuce and lucerne are crops which may suffer from bad lime distribution.

Large additions of organic matter such as compost, manure, &c., are very effective in reducing overliming injury, and this fact is of importance in indicating that a liberal addition of green or stable manure should be applied to the soil if immediate liming and seeding are necessary. Where very heavy dressings of lime are necessary, it may be advisable to apply lime in two successive seasonal applications. After the preliminary liming, the lime added in a well-made compost will go far to counteract natural losses of lime from the soil.

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

Orchard Notes for October.

THE COASTAL DISTRICTS.

OCTOBER is frequently a dry month over the greater part of Queensland, consequently the advice that has been given in the notes for August and September regarding the necessity of thorough cultivation to retain moisure is again emphasised. Unless there is an adequate supply of moisture in the soil to meet the trees' requirements, the coming season's crop will be jeopardised, as the young fruit will fail to set.

Thorough cultivation of all orchards, vineyards, and plantations is therefore imperative if the weather is dry, as the soil must be kept in a state of perfect tilth, and no weeds of any kind must be allowed to grow, as they only act as pumps to draw out the moisture from the soil that is required by the trees or fruit-yielding plants. Should the trees show the slightest sign of the want of moisture, they should be given a thorough irrigation if there is any available means of doing so, as it is unwise to allow any fruit trees to suffer for want of water if there is a possibility of their being supplied. Intermittent growth, resulting from the tree or plant being well supplied with moisture at one time and starved at another, results in serious damage, as the vitality is lessened and the tree or plant is not so well able to ward off disease. A strong, healthy, vigorous tree is frequently able to resist disease, whereas when it has become debilitated through neglect, lack of moisture or plant food, it becomes an easy prey to many pests. If an irrigation is given, see that it is a good one and that the ground is soaked; a mere surface watering is often more or less injurious, as it is apt to encourage a false growth which will not last, and also to bring the feeding roots to the surface, where they are not required, as they only die out with a dry spell and are in the way of cultivation. Irrigation should always be followed by cultivation, so as to prevent surface evaporation and thus retain the moisture in the soil.

All newly planted trees should be carefully attended to, and if they show the slightest sign of scale insects or other pests they should receive attention at once. All growth not necessary to form the future tree should be removed, such as any growths on the main stem or main branches that are not required, as if this is done now it will not only save work later on, but will tend to throw the whole strength of the tree into the production of those limbs that will form the permanent framework of the tree. In older trees all water sprouts or other similar unnecessary growths should be removed.

Keep a good lookout for scales hatching out, and treat them before they have become firmly established and are coated with their protective covering, as they are very easily killed in their early stages, and consequently much weaker sprays can be used. The best remedies to use for young scales hatching out are those that kill the insects by coming in contact with them, such as miscible oils, which can be applied at a strength of 1 part of oil in 40 parts of spraying material, and will do more good than a winter spray of double the strength. In the use of miscible oils or kerosene emulsion, always follow the directions given for the use of those spraying materials, and never apply them to evergreen trees when they are showing signs of distress resulting from a lack of moisture in the soil, as they are then likely to injure the tree, whereas if the tree is in vigorous growth they will do no harm whatever.

All leaf-eating insects should be kept in check by the use of an arsenate of lead spray, taking care to apply it as soon as the damage appears, and not to wait till the crop is ruined. Crops, such as all kinds of cucurbitaceous plants, tomatoes, and potatoes are often seriously injured by these insects, and the loss occasioned thereby can be prevented by spraying in time. In the case of tomatoes and potatoes, a combined spray of Bordeaux or Burgundy mixture and arsenate of lead should be used, as it will serve the dual purpose of destroying leaf-eating insects and of protecting the plants from the attack of Irish blight.

Grape vines require careful attention, and, if not already sprayed with Bordeaux mixture, no time should be lost in applying this material, as the only reliable method of checking such disease as anthracnose or black spot and downy mildew is to protect the wood and foliage from the attack of these diseases by providing a spray covering that will destroy any spores that may come in contact with them. The planting of bananas and pineapples can be continued during the month. See that the land is properly prepared and that good, healthy suckers only are used. Keep the plantations well worked, and allow no weed growth. Keep a very careful

lookout for fruit flies; destroy every mature insect you can, and gather and destroy every fallen fruit. If this is done systematically by all growers early in the season the subsequent crop of flies will be very materially decreased. See that all fruit sent to market during the month is carefully handled, properly graded, and well packed—not topped, but that the sample right through the case or lot is the same as that of the exposed surface.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

MUCH of the matter contained under the heading of "The Coastal Districts" applies equally to these parts of the State; for on the spring treatment that the orchard and vineyard receives the succeeding crop of fruit is very largely dependent. All orchards and vineyards must be kept in a state of perfect tilth, and no weed growth of any kind should be allowed. In the western districts, irrigation should be given whenever necessary, but growers should not depend on irrigation alone, but should combine it with the thorough cultivation of the land so as to form and keep a fine soil mulch that will prevent surface evaporation.

All newly planted trees should be carefully looked after, and only permitted to grow the branches required to form the future tree. All others should be removed as soon as they make their appearance. If there is any sign of woolly aphis, peach aphis, or scale insects, or of any fungus disease on the young trees, these diseases should be dealt with at once by the use of such remedies as black leaf forty, Bordeaux mixture, or a weak oil emulsion. In older trees, similar pests should be systematically fought, as if kept in check at the beginning of the season the crop of fruit will not suffer to any appreciable extent. Where brown rot has been present in previous years, two or more sprayings with Bordeaux mixture can be tried, as they will tend to check other fungus growths, but at the same time the sodium or potassium sulphide sprays are more effectual for this particular disease and should be used in preference when the fruit is nearly full grown. All pear, apple, and quince trees should be sprayed with arsenate of lead—first when the blossom is falling, and at intervals of about three weeks. Spraying for codlin moth is compulsory in the fruit district of Stanthorpe, and wherever pomaceous fruit is grown it must be attended to if this insect is to be kept in check.

In the warmer parts a careful check should be kept for any appearance of the fruit fly, and, should it be found, every effort should be made to trap the mature insect and to gather and destroy any affected fruit. If this is done, there is a good chance of saving the earlier ripening summer fruit, if not the bulk of the crop. Tomato and potato crops will require spraying with Bordeaux mixture, as also will grape vines. Keep a very strict watch on all grape vines, and, if they have not already been treated, don't delay a day in spraying if any sign of an oil spot, the first indication of downy mildew, appears on the top surface of the leaf. Spraying with Bordeaux mixture at once, and following the first spraying up with subsequent sprayings, if necessary, will save the crop, but if this is not done and the season is favourable for the development of the particular fungus causing this disease, growers can rest assured that their grape crop won't take long to harvest.

Where new vineyards have been planted, spraying is also very necessary, as if this is not done the young leaves and growth are apt to be so badly affected that the plant dies.

Farm Notes for October.

FIELD.—With the advent of warmer weather and the consequent increase in the soil temperature, weeds will make great headway if not checked; therefore, our advice for last month holds good with even greater force for the coming month. Earth up any crops which may require it, and keep the soil loose among them. Sow maize, cowpeas, sorghums, millet, panicums, pumpkins, melons, cucumbers, marrows. Plant sweet potatoes, yams, peanuts, arrowroot, turmeric, chicory, and ginger. Coffee plants may be planted out. There are voluminous articles in previous journals giving full instructions how to manage coffee plants from preparing the ground to harvesting the crop, to which our readers are referred.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JULY, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING JULY, 1934, AND 1933, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	July.	No. of Years' Records.	July, 1934.	July, 1933.		July.	No. of Years' Records.	July, 1934.	July, 1933.
North Coast.	In.		In.	In.	*Central Highlands.*	In.		In.	In.
Atherton	1·00	33	1·61	0·94	Clermont	1·02	63	0·33	6·82
Cairns	1·56	52	1·25	0·58	Gindie	1·09	35	..	8·44
Cardwell	1·37	62	1·38	3·18	Springsure ..	1·17	65	1·17	9·63
Cooktown	0·97	58	0·25	0·74					
Herberton	0·85	48	1·43	1·12					
Ingham	1·52	42	3·16	3·24					
Innisfail	4·60	53	5·29	4·08					
Mossman Mill ..	1·23	21	1·71	1·23	*Darling Downs.*				
Townsville	0·61	63	0·81	1·27					
Central Coast.					Dalby	1·72	64	2·78	2·57
					Emu Vale ..	1·54	38	3·16	1·97
					Hermitage ..	1·71	28	..	2·19
Ayr	0·69	47	0·52	2·07	Jimbour	1·53	46	1·85	2·46
Bowen	0·96	63	0·32	5·19	Miles	1·62	49	2·50	3·25
Charters Towers ..	0·62	52	0·69	1·53	Stanthorpe	2·02	61	3·44	2·41
Mackay	1·72	63	0·59	10·08	Toowoomba ..	2·08	62	3·81	5·53
Proserpine	1·59	31	1·65	9·29	Warwick	1·82	69	3·44	2·54
St. Lawrence ..	1·39	63	0·68	11·38					
South Coast.									
					Maranoa.				
Biggenden	1·34	35	2·13	3·61					
Bundaberg	1·80	51	1·45	4·33					
Brisbane	2·25	83	5·11	3·24	Roma	1·47	60	1·63	5·04
Caboolture	2·14	47	4·47	4·39					
Childers	1·67	39	1·40	3·94					
Crohamhurst ..	2·88	41	6·16	6·39					
Esk	1·95	47	3·15	3·14					
Gayndah	1·45	63	2·03	3·71					
Gympie	2·10	64	2·64	3·60	*State Farms, &c.*				
Kilkivan	1·60	55	2·72	3·03					
Maryborough ..	1·88	63	2·17	3·30	Bungeworgorai ..	1·43	20	1·47	4·61
Nambour	2·65	38	4·05	5·10	Gatton College ..	1·36	35	2·85	2·91
Nanango	1·64	52	3·26	2·27	Kairi	1·12	20	0·97	1·05
Rockhampton ..	1·77	63	0·42	19·52	Mackay Sugar Experiment Station	1·55	37	0·60	9·64
Woodford	2·35	47	3·86	4·70					

GEORGE G. BOND, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—JULY, 1934.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·96	79	33	84	28	51	20	25	2
Herberton	..	69	54	76	30, 31	41	8, 20	143	13
Rockhampton	30·11	74	53	81	11	42	7, 8	42	5
Brisbane	30·13	68	52	78	10	42	9	511	9
Darling Downs.									
Dalby	30·16	65	43	75	10	32	20	278	7
Stanthorpe	..	57	37	66	10	23	20, 21	344	10
Toowoomba	..	60	43	71	10	31	20	381	10
Mid-Interior.									
Georgetown	29·99	83	56	91	25	42	6	Nil	..
Longreach	30·11	73	46	81	10	37	6	155	4
Mitchell	30·16	65	40	77	10	28	21	161	5
Western.									
Burketown	30·02	81	57	85	1, 10, 15–18, 24	50	9, 22	Nil	..
Boulia	30·11	70	46	84	9	41	21, 29	148	3
Thargomindah	30·14	64	44	77	15	36	23	59	3

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	September, 1934.		October, 1934.		Sept. 1934.	Oct., 1934.
	Rises.	Sets.	Rises.	Sets.	MOONRISE. Rises.	MOONRISE. Rises.
					a.m.	a.m.
1	6·7	5·37	5·33	5·51	12·21	12·50
2	6·6	5·37	5·32	5·52	1·17	1·35
3	6·5	5·38	5·31	5·53	2·9	2·13
4	6·4	5·38	5·29	5·54	2·54	2·45
5	6·3	5·39	5·28	5·55	3·38	3·17
6	6·2	5·39	5·27	5·56	4·14	3·46
7	6·1	5·40	5·26	5·56	4·46	4·15
8	6·0	5·40	5·25	5·57	5·18	4·46
9	5·59	5·41	5·24	5·57	5·46	5·17
10	5·57	5·41	5·23	5·57	6·14	5·31
11	5·56	5·42	5·22	5·58	6·44	6·30
12	5·55	5·42	5·21	5·58	7 13	7·14
13	5·53	5·43	5·20	5·58	7·47	8·6
14	5·52	5·43	5·19	5·59	8·28	9·4
15	5·51	5·44	5·18	5·59	9·15	10·9
16	5·50	5·44	5·17	5·59	10·9	11·13
						p.m.
17	5·49	5·44	5·16	6·0	11·11	12·21
					p.m.	
18	5·48	5·45	5·15	6·0	12·16	1 28
19	5·46	5·45	5·14	6·1	1·23	2·32
20	5·45	5·46	5·12	6·2	2·33	3·38
21	5·44	5·46	5·11	6·2	3·42	4·38
22	5·43	5·47	5·10	6·3	4·47	5·40
23	5·42	5·47	5·9	6·3	5·52	6·46
24	5·41	5·47	5·8	6·4	6·59	7·52
25	5·40	5·48	5·7	6·5	8·3	8·59
26	5·39	5·48	5·6	6·6	9·6	9·48
27	5·37	5·49	5·6	6·6	10·8	10·42
28	5·36	5·49	5·5	6·7	11·6	11·28
29	5·35	5·50	5.4	6.7	12·0	a.m.
30	5·34	5 50	5·4	6·8	..	12·10
31			5·3	6·9	..	12·45

Phases of the Moon, Occultations, &c.

1 Sept.	☽ Last Quarter	5	40 a.m.
9 ,,	● New Moon	10	20 a.m.
16 ,,	☾ First Quarter	10	26 p.m.
23 ,,	○ Full Moon	2	19 p.m.
30 ,,	Last Quarter	10	29 p.m.

Apogee, 5th September, at 4.6 p.m.
Perigee, 21st September, at 11.6 a.m.

At 5 p.m. on the 12th the crescent Moon will be passing from west to east of Jupiter, which will be at a distance of 7 degrees to the north of it. The Moon and Jupiter will be high up in the north-west, coming into view an hour later.

An occultation of Antares will occur on 15th September, which will be more noticeable in the f. r west of Queensland than on the eastern coast, where the Moon and star will be on or near the western horizon, setting a little before midnight.

When Jupiter sets at 7.30 p.m. on the 29th the rapidly moving planet Mercury will follow it about 6 minutes later. The nearness of the two planets to one another will be noticeable half an hour or more before they disappear, the Sun having set at 5.50.

An interesting spectacle for observers with a telescope would have been afforded about a quarter past 5 a.m. for several mornings, especially on the 21st, by the apparent nearness of Venus and Neptune, then being only half a degree apart (a distance equal to the width of the Moon), if it had not been for the increasing daylight, sunrise being at 5.44.

Mercury sets 23 minutes after the Sun on the 1st; on the 15th it sets at 6.53 p.m., one hour after the Sun.

Venus rises at 5.7 a.m. on the 1st, and at 5.6 a.m. on the 15th.

Mars rises at 4.8 a.m. on the 1st and at 3.46 a.m. on the 15th.

Jupiter sets at 8.46 p.m. on the 1st and at 8.13 p.m. on the 15th.

Saturn rises at 4.25 p.m. and sets at 5.37 a.m. on the 1st; on the 15th it rises at 3.11 p.m. and sets at 4.38 a.m.

When the Southern Cross comes into view soon after sunset on the 1st, it will be noticeably curving downwards towards its greatest western elongation, indicated by III. on the clockface, which it will reach at 8 p.m. if the observer is near the 150th meridian. It will then be 30 degrees from the South Celestial Pole, after which it will continue to curve downwards till 2 a.m., when it will reach position VI. and be due south. In this position it becomes lost in Queensland, not reappearing till the following evening, when the positions mentioned will be reached 4 minutes earlier.

9 Oct.,	● New Moon	1	5 a.m.
16 ,,	☾ First Quarter	5	29 a.m.
23 ,,	○ Full Moon	1	1 a.m.
30 ,,	☽ Last Quarter	6	22 p.m.

Apogee, 3rd October, at 7.54 a.m.
Perigee, 19th October, at 12.18 a.m.
Apogee, 31st October, at 3.24 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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